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Report on Forestry in the Trust Territory of the Pacific Islands

by Colin Marshall

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REPORT ON FORESTRY IN THE TRUST TERRITORY OF THE PACIFIC ISLANDS

by

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Numerous scientific studies of these territories have been made by U. S. Naval personnel, by the U. S. Commercial Company's staff, by scientists under the CIMA and SIM programs of the Pacific Science Board. It would be a waste of time for the writer to collate as part of his report, the mass of information relative to forestry available in these reports. He has made use of all reports he was able to consult, and wishes to acknowledge the immense assistance these reports have been to him.

INTRODUCTION

The people of the United States of America have accepted the trusteeship of all the islands in the 3,000,000 square miles of ocean stretching from latitude 1° North to 20° North, and from longitude 130° East to 170° East. In this vast sea area, about the size of the United States, are ninety-six distinct island units or clusters of islands having a combined land area equal to a block of land only thirty miles along by twenty-three miles wide, an area of 687 square miles or 439,680 acres.

These islands must, in the writer's opinion, for the safety of the United States and the peace of the South Pacific, remain a strategic area trusteeship as long as national armed forces are necessary. Guam, acquired from Spain by the treaty of Paris, 1898, is the natural center from which radiate almost all air and sea communications in the Trust Territory. Though its forestry problems and requirements are very similar to those of the other islands, it is under a separate administration and is not covered, though it is often mentioned, in this report.

The Supreme Court of the United States pointed out in a review of a recent decision (referring to forestry) that "a great 'unwritten compact' exists between 'the dead, the living and the unborn'". The court believes that "such a compact requires that we leave to the unborn something more than debts and depleted natural resources. Surely, when natural resources can be utilized and at the same time perpetuated for future generations, what has been called 'constitutional morality' requires that we do so." The New York Times saw in this decision "the seal of approval on a principle that may well have profound influence on the future well being of this country. Its importance," the Times stated editorially, "lies in its endorsement of the theory, still somewhat novel to most Americans, that private owners of the nation's renewable

natural resources do not have the unqualified right to use and destroy them as they see fit. The court has held, in effect that they bear a deep responsibility to the nation as a whole, and to generations to come, and if they do not recognize this responsibility, the state has the right and the duty of forcing it upon them." The American Forestry Association, though aware of the implications and the dangers to the American way of life, applauded this action of the Supreme Court.

Subject only to vital strategic considerations, it is the aim of the United States to insure the health, survival, and self-sufficiency of the people of the Trust Territory and their development by a moderate but continuous contact with, and participation in, the network of world commerce and progress rather than by any attempt at a sudden and radical change of their way of life.

In "Unasylva", the periodical of the Forestry Branch of the Food and Agricultural Organization of the United Nations, Vol. IV, No. I, Editorial, it is written, "Natural resources are now finding that place in the consultations of governments to which their importance as the essential bases of life and wealth entitles them. Today the direct connection between the extent of available resources and the number of people that the world can support with reasonable health and comfort is widely realized."

In order to assess the natural resources of the Trust Territory the Pacific Science Board of the National ResearchCouncil has arranged for a large number of scientists to visit the territory and to report on special aspects of the problem. Mr. Ernest G. Holt served on the Conservation Committee for Micronesia and reported on the steps necessary to conserve the natural resources of the area. The writer, as a practicing administrative forester, was assigned to report on the forestry aspects of the economy of these islands.

In carrying out these investigations, and in preparing recommendations, the writer has given special attention to the following observations made by the International Timber Conference, of the F.A.O. of the United Nations, held at Marianski Landz, Czechoslovakia, April-May 1947; report page 51: "The Conference recognizes that the world-wide shortage of timber cannot be solved within the limited framework of timber resources, cuttings, distribution, and consumption, but depends to a very great extent upon the solutions of other economic problems amongst which are questions of finance, credit, and means of payment, availability of transportation and labor, and inter-relation with other commodities such as coal and machinery; conversely, developments within the field of forest policies and practices, and of the timber trade, influence the solution of other economic problems."

The same report, page 50: "The conference recommends the establishment by all countries of rational domestic forest policies based on the wise use of existing forests, reafforestation of cleared land and afforestation of waste land....The conference urges the expansion of forest research work, especially as regards tropical timbers....The conference calls the attention of governments to the desirability of giving high priority in their national financial and economic plans to the claims of afforestation, reafforestation, and the improvement of exploitation facilities."

In his official application for this assignment, the writer suggested that he should carry out a survey and submit practical plans for the management of existing forests and plantations, together with recommendations in regard to the establishment of other exotic species as plantation crops. To make a full detailed examination, report, and recommendations would take over a year. As, unfortunately, owing to the international situation, the period was limited to three months, the writer has concentrated on producing a practical plan,

capable of implementation by the limited number of officials the Department of the Interior will employ in the commencement of its administration. The proposed plan is based on such permanent foundations of forest management and procedure as will enable a trained forest officer to raise on this base a forestry economy which will increase the health, wealth, and happiness of the people of the area, and at the same time increase the strategic value of these islands and lessen their dependence on outside assistance.

The Trust Territory, peopled as it is with natives accustomed to obeying foreign rulers, with a warm equable climate, adequate rainfall, and in many areas, fertile soil, represent a site for the development of not only ideal forestry plantations, but ideal agriculture, ideal social development, ideal education, ideal health services, and idealistic social theories. In this report an attempt has been made to indicate the lines of development which, if followed, will in time make the islands of the Trust Territory economically self-supporting.

In this report the writer, while dealing in greater detail with forestry proper, must in order to cover his subject properly outline suggestions covering agriculture, water conservation, and soil and wild-life conservation, indeed the total land-use science called "terraculture." There are Agriculture Officers in the Territory, but they are too few in number and have inadequate staff and authority. Yet it is upon the efforts of those and similar officers that we must rely, not only to prevent these islands from being permanently parasitic on the taxpayer of the United States, but also to enable them to advance to a fuller and better self-supporting life.

It would be simple to advise the planting of extensive areas with suitable and valuable trees. If the writer did so he would be a dendrologist, not a true forester. This report lays down a pattern which, if followed, will

permit the people of Micronesia to develop as men standing on their own feet, producing their share of the world's wealth, and not as semi-savages, spectacles for tourists, dependent on the taxpayers of the United States.

SUMMARY OF REPORT

These islands have no forests which in the immediate future can be developed to provide a lumber crop either for export as a cash crop or for local use to raise the standard of housing. There are on the islands no sawmills which have either the efficient equipment or the assured log supply necessary to give a sustained yield of even 500 super feet per day. There is practically no local market among the native inhabitants for sawed lumber and lumber is not imported in any significant quantity except for the use of the Territory administrative personnel.

The natives obtain the small quantity of lumber they require from scattered trees, often breadfruit in their villages. There is no local supply of labor, and there are no energetic natives with sufficient interest in timber to make lumber production a full-time occupation. The high price of copra and the comparatively high rates of wages paid to Naval employees make it certain that no timber produced in these islands can now compete in the world's commercial markets. The needs of lumber of the natives, of the high islands in the Marianas and the Carolines, are adequately met by cutting large breadfruit and other trees in the villages and occasional large hard-timbered trees, mainly of pole size, from the mangrove forests surrounding these islands.

These statements are not intended, however, to imply that forestry need receive no attention in the future administration of these islands. There is urgent need of forestry, in its widest and best sense, to receive full consideration in the development plans for the Territory. Forestry, together with agriculture, has the duty of providing the basic plan for the development of the natural resources of these islands, for producing a total Land-Use Plan, a plan of efficient Terraculture. This is a Basic Technical Resource Plan which can be drawn up only by technically qualified men.

The primary task of the government must be to determine who owns each piece of land. This does not mean that only land which has been enclosed or surveyed and granted under legal title to an individual should be considered. The completion of that task is urgent. The ownership of "rights" by various tribes over their tribal land, and the determination of the boundaries of tribal land is also urgently required. These latter "rights" to "usufruct", the use and the fruit, have been ignored by past national administrations. Only when this survey is complete will the administration know with whom to negotiate in regard to any piece of land. Following this ownership survey the Basic Technical Resource Plan, or Land Capability Inventory, can be prepared.

The native population of these islands will increase rapidly now that the public-health services have started to reduce infant mortality and increase the general health of the people. Their needs will grow as educational facilities become general. There is at present only one major crop, copra, and two minor items of export, trochus shells and handicrafts. In this machine age the demand for, and the return from, the latter export will doubtless fall in the not distant future. Timber is becoming more and more scarce in the world's markets. A timber crop planted in these productive islands would provide a source of income for the future and a source of tax revenue.

It is essential that these islands shall be made self-supporting. This can be accomplished if forestry develops as a plantation industry. The planting of trees indiscriminately and then leaving them to be felled equally indiscriminately by some islander is not forestry; it is not even common sense.

It is of the greatest importance that, even at the risk of arousing local resentment, an executive order should be issued making it an offense to cut any mangrove tree under one foot in circumference along any seashore. This order is necessary in order to prevent wave erosion which is now destroying for ever the flat alluvial land behind the protective mangrove fringe.

The Department of Agriculture is inadequately staffed and has far from adequate funds. Forestry, at present non-existent, will naturally be the other face of this Janus-headed practical science, Terraculture. A senior graduate forester with broad practical training is needed to supervise the operations which should be started on each island by some trained, locally born Forest Guard. Much of the time of this Director of Forestry will be spent traveling. He must be free from local executive responsibility. For this reason it will be of advantage if during the early years the Forest Nurseries are situated in the Agricultural Stations and if the Forest Guards are under the executive supervision of the local Agricultural Station Superintendent.

The Director of Forestry will, as soon as possible, prepare plans for the survey and for the acquisition by his department of control over water-catchment areas. When such control is obtained, the public notice proclaiming this must detail all rights and privileges in this area reserved by law to the villages, tribes, or individuals living near or who are by native customs, entitled to "rights" over the area.

It is urged that the efficiency of American private enterprise be utilized to harvest and convert any forest produce which becomes available.

The Fifth British Empire Forestry Conference, 1947, in which errors of the past were discussed and lines of policy for the future were laid down, passed the following significant resolutions and drew attention to the following facts. It is suggested that American administrators should learn by our mistakes and our experience.

> "Attention was drawn by all delegates to the necessity for co-operation between all concerned - the landowners and tenants, the forest agricultural and animal husbandry authorities, the irrigation authorities, and not least the administration, which has in the past been most reluctant to move in the matter. The soil is man's major form of capital, and improper land use and erosion strike at the very roots of man's economic structure, resulting in the loss of water, timber, fuel, grazing, and food itself. The need for a supreme land-use authority in most countries of the Empire, with direction at the highest level was emphasized and attention drawn to the lack of very necessary land use surveys."

The Conference reaffirmed the resolution of the First Conference as follows:

> "In view of the great importance to the Empire as a whole, as well as to each of its component parts, of producing a sustained yield of all classes of timber, of encouraging the most economical utilization of timber, and of other forest products, and of maintaining and improving climatic conditions in the interests of agriculture and water supply, each of the Governments of the Empire should lay down a definite forest policy to be administered by a properly constituted and adequate forest service."

Delegates have shown that "although during the past twelve years a considerable advance has been made in the technique of soil conservation, it is in the field of application that the greatest difficulties are being experienced. They may be summarized as follows:

> "To convince an enlightened people of the benefits of a sound land policy which might, at the outset, place restrictions on their activities and compel them to change age-long customs.
>
> "To convince administrations of the necessity for prudent land management, and for legislation and active measures to implement such a policy."

The writer feels that the conditions in the Trust Territory are very similar to those in the British Empire.

It is recommended that the High Commissioner of the Trust Territory make an official pronouncement on the following lines:

> "It is the policy of the Administration of the Trust Territory of the Pacific Islands so to control the use of all natural resources, and in particular the growing and harvesting of forest products, that these natural resources may make an adequate contribution, both to the general revenue of the Territory and to the owners of the land on which they grow or are found; at the same time so to utilize forests and the science of forestry, not only to maintain or improve the climate and water supply of the islands of the Trust Territory, but also to enable the forests of the Trust Territory to produce sufficient lumber to meet local needs, at present and in the foreseeable future, and in addition to provide a valuable export crop. To this end it is the intention of the administration that a Department of Forestry adequately staffed, trained, equipped, and financed shall be formed."

THE PEOPLE, THEIR NEEDS AND THEIR ABILITY

Trees are a crop which take many years to mature, in some cases as long as 200 years. Forestry operations to prevent erosion, or to ameliorate economic or social conditions cannot reach their full fruition until two or three generations have passed. This report, to be of permanent value, must envisage the trend of present conditions in so far as they affect forestry.

The population which had for many years been sinking has, under the American benevolent administration and fine health services, commenced to rise. Even the people of Yap, who were thought to have lost the desire to live, are increasing. Its 54,299 people in 1950 may easily become 100,000 by 1970 and 250,000 by the year 2,000. Already the low islands are reaching their limit of population, Mokil having 648 people per square mile, while Pingelap has 908.8 or an average of only 0.7 acres per head. The overall population density is 82.2 per square mile. For comparison, that of Continental America is 50.6, of the world is 41.0, of Japan 532, and of England and Wales 753. Countries with high population densities must develop their productive capacity to the uttermost - or starve.

The educational, medical, and constitutional advances, which the writer noted and applauded, will be a barren, impermanent achievement unless accompanied at the same time, and at the same pace by economic advances, raising the standard of living of the people. The example of white traders and plantation managers, of white private individuals, living in the islands and producing by their own efforts the wealth necessary for their higher standard of living, will be followed enthusiastically by the educated islanders now being produced by the schools. Exploitation can be controlled by laws and good administration, but development is not exploitation.

This development can be accomplished without heavy expenditure. Indeed the U. S. taxpayer need not, should not, be permanently burdened to provide free services for the Micronesians. Further details of the development scheme are given in Section on GOVERNMENT LAND. This scheme has been successful in another Pacific Island group with a land area of 1,130 square miles and a rising population now numbering 73,155 - the United Nations Trusteeship Territory mandated to New Zealand - Western Samoa.

Provided that Development for Production is accepted as a cardinal principle in administration, then forestry can plan for the future. There is no need of anticipating a rapid rise in the demand for lumber, but the demand will rise, and a steady increase in the sawmill capacity of the high islands is to be advocated. The production of mangrove firewood and mangrove charcoal, as well as the secondary product quicklime, will increase. The figures in Table I on the following page show what was produced between 1931 and 1935 when the Japanese were developing these islands. It is true that, in order to develop, the Japanese introduced Japanese colonists, who at the outbreak of the Pacific war in 1941, definitely outnumbered the native inhabitants. The increase in the local population in the next two to three decades will certainly make up for the lost Japanese manpower. Whether they will equal the Japanese in energy, depends on the training they receive under American tutilage.

It will be noted in the table that whereas the production of timber was insignificant, and in any case has completely depleted the accessable forest areas, the production of firewood and charcoal was relatively very large. This is a field for development offering a profit in the near future. Americans coming from an oil-electricity surplus economy find it hard to realize that in these islands oil may, through blockade and war, become unobtainable. These islands naturally belong to the solid fuel (firewood) deficit economy.

It is urged that the wage rate be not fixed by administrative order, but be allowed to find its own level according to the laws of supply and demand. If a Palauan, who can produce a unit article in four days, is, by executive order, given the same wage as a worker in Pittsburgh, who will produce the same article in two hours, then the Palauan article will be unsalable in the world market. The Palauan worker living in a warmer climate, among people producing cheaper food, does not need the same wage.

It is of great importance that this fact be realized, for the high wages paid in American Samoa and the high wages paid during the war elsewhere in the Pacific have in reality been a grave disservice to the local economy, and still cause economic and social unrest. Unless wages are automatically and freely adjustable to the world selling price of lumber, firewood, and charcoal, any forestry development will be merely a cash gift from the American taxpayer.

Copra, selling on a world market, seems the best cash crop at present. The following table shows the purchases by the Island Trading Company for the year ending June 1950:

Place Purchased	Copra	Handicrafts	Trochus and Other Shells	Other	Total
Yap	$ 10,696	$ 1,071	-	$2,289	$14,056
Palau	72,075	7,148	$11,535	4,271	95,029
Truk	147,205	3,950	13,498	7,381	172,034
Ponape	244,363	57,229	19,550	1,435	322,577
Majuro	159,772	3,398	-	134	163,304
Kwajelein	147,929	4,259	695	-	152,883
Total Trust Territory	$782,040	$77,055	$45,278	$15,510	$919,883
Guam	-	143	371	393	907

It will be noted that Guam produces practically nothing. American administration has been so kind to the Guamanians that they have not developed their island to produce anything. Mr. Willard Price in his article on these islands in the National Geographic Magazine of June 1942, reports that when he sailed past Guam in a Japanese ship before the war - "a Japanese gentleman at the rail said mournfully, 'The largest and finest of all these islands. And not used!'" The criticism is just. Unless some plan for developing primary production in the Trust Territory is pursued with vigor, they will be a continued expense and worry to America.

The figures for trade goods sold to the various island stations, given on a per capita basis, show the immense market awaiting development, if these people can have export crops to give in exchange. The figures are: Kwajalein $44.95, Majuro $38.36, Ponape $31.07, Truk $13.13, Yap $12.33 and Palau $18.36.

There is one point of very great importance in connection with Guam, yet germain to terraculture in the Trust Territory, which must receive early attention if development is to succeed: the floral and faunal communities of these isolated Pacific islands were in a state of equilibrium until various other species have become pests menacing the economic production or even the very existence of certain crops. The rhinoceros beetle on the Palau coconuts is an example. It is urged that the spraying of planes and examination of ships' cargoes receive more serious attention. A few breeding insects, once introduced, can never be completely eradicated, and can be kept under control only at the expense of ceaseless vigilance and expense.

TABLE "A"

LOCAL LUMBER PRODUCTION

1. Native Name.
2. Japanese Name.
3. Scientific Name.

		YEAR					
		1931	1932	1933	1934	1935	Sa
Total U. S. Dollars	LUMBER	2,077	1,868	3,798	2,224	4,329	
Total Japanese Yen	LUMBER	8,308	7,473	15,193	8,895	17,318	
Total Cubic Metres	LUMBER	1,101	1,022	3,243	1,713	4,985	
1. Ptaches 2. Tamana 3. Calophyllum inophyllum	Y	847	624	465	731	1,019	
	M3	123	74	87	128	161	
1. Ukall 2. Ukaru 3.	Y	122	195	153	66	31	
	M3	124	179	157	73	34	
1. Las 2. Benistan	Y	29	-	-	-	55	
	M3	24	-	-	-	46	
1. Dort 2. Atsu Boku 3. Intsia bijuga	Y	2,220	2,611	4,709	581	6,288	6,
	M3	59	49	944	121	2,595	2,
1. Ngmui 2. Ammui 3. Urandra ammui	Y	47	11	54	15	12	
	M3	52	12	60	16	14	
1. Blakeas 2. Purakios 3.	Y	2	7	2	4	16	
	M3	2	6	2	5	17	
1. Esmoloh 2. Kashimoroku	Y	-	-	-	13	74	
	M3	-	-	-	15	86	

UCTION

For 1935 by Districts

Saipan	Yap	Palau	Truk	Ponape	Marshalls
67	156	22	774	-	-
9	18	24	110	-	-
-	-	31	-	-	-
-	-	34	-	-	-
-	-	55	-	-	-
-	-	46	-	-	-
6,280	-	8	-	-	-
2,593	-	2	-	-	-
-	-	12	-	-	-
-	-	14	-	-	-
-	-	17	-	-	-
-	-	16	-	-	-
-	-	74	-	-	-
-	-	86	-	-	-

TABLE "A" cont'd.

	Lumber	1931	1932	1933	1934	1935
1. Mduu 2. Panoki (Breadfruit) 3. Artocarpus communis	Y	1,658	1,947	1,943	1,608	2,084
	M3	148	196	326	244	293
1. Ngas 2. Mokuama 3. Casuarina equiset-ifolia	Y	-	-	-	27	170
	M3	-	-	-	10	61
1. Miich 2. Momotamana 3. Ochrocarpus excel-sus	Y	96	48	-	-	-
	M3	2	1	-	-	-
1. 2. Mangrop 3. Mangrove Species	Y	1,352	1,021	6,670	5,062	6,930
	M3	380	393	1,196	872	1,398
Other	Y	1,935	1,009	1,197	788	639
	M3	186	112	470	229	280
Firewood	Y	199,394	130,998	11,299	11,312	11,210
	M3	108,234	85,506	61,337	37,898	40,898
Charcoal	Y		41,762	37,851	63,057	61,808
Kilograms	Kg	1,406,882	1,053, 070	903,214	1,276,545	1,461,607
Grand Total Yen:		250,603	180,233	64,343	83,264	90,336
Grand Total Dollars:		62,651	45,058	16,086	20,816	22,584

Note: Manual Labor Wate Rate Per Day: Unskilled Y4; Semiskilled Y6

1935	Saipan	Yap	Palau	Truk	Ponape	Marshalls
2,084	104	600	-	414	-	966
293	34	75	-	115	-	69
170	11	-	159	-	-	-
61	2	-	59	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
6,930	-	5,914	475	28	513	-
1,398	-	822	176	14	382	-
639	-	508	20	-	111	-
280	-	51	22	-	207	-
11,210	5,065	85	829	358	323	4,550
40,898	32,755	48	4,605	2,153	687	650
61,808	31,818	5,069	14,712	6,187	3,637	385
,461,607	662,880	136,977	459,750	123,750	72,750	5,500
90,336						
22,584						

LAND TENURE

The establishment of a system of land tenure which will satisfy both the expressed and the subconscious demands of the local peoples is probably the most important duty of the government of the Trust Territory. It was unfortunately obvious that the basic principles on which modern land-tenure concepts are based were not clearly understood by all in the islands. The writer must, therefore, go into much detail.

It is most significant that the customs of primitive peoples in Europe and in the Pacific islands should find a support and an echo in the recent ruling of the Supreme Court of the United States, quoted earlier in this report. In primitive peoples, and in some islands of the Pacific to this day, it is recognized that no individual may own any land entirely and absolutely. Each tribe owned, and waged war to preserve,its ownership of tracts of land. Individual members had, however, the right to the use and the fruit, usufruct, of the land they tended and cultivated. All members of the tribe had the right to take lumber, firewood, or other forest produce from the "common lands", they had the right to hunt and to graze their herds there. Then in the middle ages, men powerful enough to oppose the local majority started to claim the sole ownership of certain blocks of land and to fence these lands in. The period of "The Enclosures" was a period of suffering and unrest in England and Europe. In later years the "Rights" of "Rightholders" over certain "Common lands" were recorded, and the government assumed ownership of such "commons."

This system was so ingrained in the mentality of the early settlers in America that they did not realize they were settling on land really "owned" by some Red Indian tribe, no member of whom had any right to sell his tribal land which belonged to his ancestors, to him, and to his descendants. It was

assumed that land not "enclosed" was owned by Government. It was also assumed that a man had the right to do with his own land whatever he chose.

In recent years the wisdom of ancient ethical ideas has become more apparent, and the tribe or community denies to any man the right to kill or even to illtreat another member of the community, even if such member is "his own" wife or "his own" child. The community, establishing once again its ultimate ownership of everything, now asserts its right to take away in taxes such part of any man's property as it sees fit. It asserts its right to demand that any member of the community shall, if ordered, go into a position of danger on the battlefield where he will be certain to lose. The Supreme Court of the United States on November 7th, 1949, set the seal of its approval on the principle that private owners of the nation's renewable natural rescurces have not an unqualified liberty to use and destroy them as they see fit.

To these islands where individual land ownership was unknown, came first the Spanish, then the very methodical Germans, and then the precise, legalistic Japanese. They all forced the acceptance of individual land ownership on the islanders. In some cases they succeeded, at the cost of resentment. They further claimed for the Government all land not enclosed and under cultivation. The American administration, in default of any complete study of local land tenure, has followed the Japanese system and is attempting to obtain legal proof of present ownership. There is resentment that even the legal deeds of land ownership are not yet prepared. This resentment was the subject of a petition to the United Nations Mission, but more significant was the request that their tribal lands be returned. This problem is wisely recognized in the U. S. Navy's Handbook of the Trust Territories.

Now that the anthropologists have detailed the basic land-use concepts of the various islanders, it is urged that the "Rights" of individual tribes

over all unoccupied land be recorded and the boundaries of each tribal block be demarcated on the ground, surveyed, and recorded on a map. This is work for a team of surveyors working in the field.

Once it is determined which tribe owns or "holds Rights" over each area, then the future policy in regard to land alienation to individuals can be decided, In Fiji the British Administration does not permit the permanent alienation or sale of any tribal land. All tribal land is controlled by the Native Land Trust Board which, though it contains some government officials, is not part of the government, but is a Board of Trustees. This Board leases vacant tribal land to aliens on terms which seem to the Board to be just. It collects the rent and pays it to the native tribe concerned. The Department of Forestry in Fiji similarly grants to individuals the right to cut lumber on native land subject to the permission of the Native Land Trust Board and collects a tax for Government and a royalty for the owning tribe on the lumber cut.

In Samoa, where the surveys are not yet complete, permits to occupy land are issued "subject to Samoan custom and usage." The customs and usage have yet to be classified and are decided in each case by a meeting of the elders of the village.

It is recommended that, except for blocks of freehold land the title of which was clear before the war, alienation in the future be by lease subject to definite rules agreed to by the chiefs of the island group.

FOREST-LAND TENURE

It is an accepted principle of modern forestry that the community must control the management of its forest areas.

Commercial lumber forestry is, in effect, the farming of a crop which can be harvested not only when mature but also at almost any time during the growing period. Naturally if the crop is harvested before it is mature, only small-sized timber is obtained and the average annual yield may be smaller. On the other hand, thinnings removed at intervals during the rotation yield a financial return. In other words commercial lumber production is an industry in which large amounts of readily realizable capital form the growing stock.

In backward territories, where tribes own, or have "Rights" over, large areas of forest, it is not a practical proposition to expect them to understand or practice sustained yield management. The system introduced into Fiji by the writer and accepted with minor modifications by the Legislative Council and by the Council of Chiefs, is for the Department of Forestry to accept, as a trustee, the duty of managing such areas of tribal-owned land or of land owned by any private individuals or of land owned by the government. The department manages the forest scientifically and pays to the landowner a royalty fixed by law on all forest produce cut and removed. At the same time it collects for Government a tax on this forest produce and, for the departmental expense account, a "cess" designed to cover the costs of department operations.

When land is "dedicated" to forestry or handed over to the department to manage, it is of the greatest importance that all the proceedings should be public and should be recorded for posterity in a legal publication like the "Government Gazette." Notices of the intention to hold this inquiry must be posted some weeks before; the inquiry must be held, not by the Forest Officer,

but by the Administrative Officer. He will ascertain from written petitions, from verbal requests, and from the examination of witnesses, what "rights" have been exercised in the past over the area, what "rights" should be preserved, and what "rights" will be extinguished either by a cash payment or by an agreement to accept the royalty collected instead of an immediate cash payment. The local inhabitants must be satisfied or the forest will never be safe from sabotage or theft. There is no better guardian of a forest area than a local "rightholder" or a member of a tribe which receive royalty from the forest.

Once the inquiry is closed, the full text of the agreement to dedicate the land, together with a detailed description of the land and its boundaries, with a list of all "rights" or "privileges" recorded as continuing over the area, shall be published. After that date no new rights may be acquired in the area, which shall be under the absolute control, subject to the "rights", of the Director of Forestry.

A "right" shall be described in a way that shall prevent strangers settling in the area from acquiring a share in the "right." The "right" may be to "so many" poles for homebuilding per year, or to the firewood required by the people of the such and such tribe, or to "so many acres of shifting cultivation land shall be made available to the people of such and such a tribe per year." The exercise of all rights shall be subject to the control of the Director of Forestry, and no right shall be admitted which may result in the destruction of the forest as such.

It is recommended that the Trust Territory shall adopt this system under which the Department of Forestry becomes the trustee of all tribal or other dedicated land which it is desired to keep under forest.

GOVERNMENT LAND

There is some land over which it appears that the government has control. It is well to examine the validity of title to this land before considering its use to grow a long-term crop like lumber.

Class I are the areas of the so-called Public Domain. As we have seen in previous sections there are tribes that claim ownership of these "public" lands. They certainly appear to have, ethically, very definite hereditary "rights" to these lands. The Administration of the Trust Territory should consider appointing itself as trustee of such lands and where it "leases" any part of such lands it should obtain for the native holders of rights some compensation for any rights extinguished over such leased blocks. This applies equally to leases to private individuals, to other government agencies, or to the Department of Forestry.

Class II are areas of land formerly owned and occupied by the Japanese administration of the Territory. This does not include land occupied by the Japanese Military and that now occupied by the U. S. Navy for naval purposes. Those local administration areas are definitely the property of the Government of the Trust Territory.

Class III are areas of land formerly owned and occupied by the Japanese Military. These, as spoils of war, are definitely the property of the Government of the United States, not of the Trust Territory.

Class IV are farms and estates formerly owned by Japanese nationals or Japanese commercial companies. These too belong to the Government of the United States.

It may be of interest to note with regard to the disposition of government lands in Pacific Islands, in 1914 when New Zealand troops captured German, or Western Samoa, the Gernman-owned estates were seized and placed under the

management of experienced plantation managers. At the peace treaty of Verseilles, these estates were awarded to New Zealand and were constituted the "New Zealand Reparations Estates." Since then they have been managed on strictly commercial lines, paying taxes like any other company. For a very short time they required a grant from government funds, then they began to show a net profit. For many years the exports from these Reparation Estates have supplied the principal item of taxation revenue for the Government of Western Samoa. The net profits, after tax deduction, were remitted to New Zealand and were a contribution to the costs of pensions for disabled soldiers. In 1949, the New Zealand Government generously decided that in the future the profits from these estates should be used for the benefit of the people of Samoa only and be applied to paying the cost of scholarships for overseas studies to be awarded to Samoans.

These Reparation Estates besides providing employment, tax revenue, and a gift of their profits, have also provided a training ground and an example, teaching the local peasants the best way to grow the various crops. The Estates have developed a high yielding strain of coconuts, have excellent cocoa plantations, have planted para rubber areas as a war reserve, have introduced improved strains of cattle, and have in every way enriched the community.

It is recommended that all ex-Japanese lands in Class III and IV detailed above be constituted a Reparation Estate. The coconut plantation at Metalanim, originally developed by the German Jaluit Geschellschaft, is being run on semi-commercial lines and is the brightest spot in the Territory. It holds hope that in the future these islands will not be a burden on the American taxpayer. The Japanese owners, the Nanyoboeykki Kaisha, made a profit from its management of the estate. Had this estate been fully rehabilitated in 1945-46, it would now be making a much larger profit.

In urging the Administration to place commercial development in the forefront of its plans, the words of Major William K. Anderson, an American who has lived since 1898 in the Philippines, must be quoted. In his book, The Philippine Problem, he writes, "So-called idealism and philanthropy were said to be the prime factors in motivating our policy towards the Philippines.... In other words, the experimental government of the islands was to be an amazing example of perpetual motion without the driving power furnished by taxes paid by business, and commercial enterprise....American officials regarded the Philippines simply as a field for altruistic attempts to qualify the Filipinos for self-government and in no sense as a trade asset to be utilized and improved on behalf of the American and Philippine peoples. The officials failed to recognize the altogether backward economic condition of the islands or to appreciate the fact that only through a development of the natural resources of the archipelago and a material increase in insular revenues and in the per capita wealth of the natives could self-government ever become a working reality. In other words, our government centered its efforts on the education and cultural uplift of the Filipinos, and completely ignored other and absolutely essential factors of the equation....it was natural to expect that every encouragement and facility would be afforded to American capital to enter the islands and share with the Filipinos the benefits which would accrue from a development of these idle and unproductive sources of wealth. It was a surprise therefore to hear Governor Taft say publicly that 'corroded Americans in business,' who did not like what was going on, could return to the United States on the first boat. Any American business man who desired to engage in business would do so at his own risk, and with a thorough understanding that he was not wanted. He treated them as though they were mere exploiters of Mr. Taft's 'little brown brothers'".

Some people in the Trust Territory fear that the natural idealism and altruism so characteristic of Americans, especially of Americans with high academic qualifications, will force a similar policy on these islands. The writer urges those, who will frame the policy of the Territory, to read Major Anderson's book, and to consider the very different picture presented by Western Samoa.

LAND AND SOIL

The uses to which land can be put and the abuse the soil will withstand are much more limited in the tropics than in temperate regions. Tropical soils are rarely as rich as temperate soils and lose their fertility very rapidly. The lush vegetation of tropical jungles is the result of a build-up of plant-food materials over very long periods.

In the past the standard system of agriculture in the high Pacific islands was the cultivation of swamp taro in the valley bottoms, or in artificial swamp areas, and a form of shifting cultivation on the neighboring hills. This shifting cultivation destroyed the areas of mature forest, but as there was no demand for lumber and as the area was abandoned after a year and permitted to come up again in forest the system did relatively little harm. We can even say that this long-term tree-fallow was a good method of cultivation under the local conditions.

Until European and American sailors visited these islands, the natives had no iron knives or axes. The area of forest they were able to clear with stone or giant clam-shell axes or adzes was very limited. The digging stick was the only instrument used to plant vegetables. They had no spades, hoes, or ploughs to disturb the soil. Their population was kept low by wars and by a high infant mortality. In those days, too, there were no cattle, sheep, or goats on the islands, perhaps even no pigs or any other mammals.

There were few local grasses. When an area of forest had been felled and burnt and food crops had been planted in the new "garden," the land was left alone and not needed. The planting with a digging stick had hardly disturbed the soil, and as the fire was rarely fierce, dormant seeds and root suckers soon appeared. These, together with the vegetables, seized upon all

available plant food and held it against the leaching effects of the rain. After the food crop had been reaped, the area soon became choked with a mass of fast-growing, secondary-forest type trees and vines and gradually reverted to high forest.

With the coming of Euro-Asiatic iron-age culture, the natives were suddenly enabled to attack the forest and destroy their land and soil almost as efficiently as the people of the Middle East, the Nile Valley, the Mediterranean, India, China, and America have destroyed the natural resources of their lands. Now that modern health measures are reducing infant mortality and prolonging life, it is certain that these islands will soon become denuded of natural resources unless the full force of modern conservation knowledge is applied by adequately staffed Land-Use Departments. It is extremely fortunate that the rocky nature of the soil prevents our oil-age civilization from giving the islanders mechanical power to assist them in preparing the soil for erosion in the heavy tropical rains. The introduction of grasses necessary for cattle, and the annual firing of grass lands and of lands which the grazers hope can be made grass lands, are causing serious damage to soils in all these tropical islands.

All the lime in tropical rain-forest soils is held either in the stems, branches, roots, and leaves of plants, or in the decaying stems and leaves on the ground. As soon as it is released from a burnt or decaying stem or leaf, it is dissolved by the heavy tropical rain and, unless it is immediately reabsorbed by the roots of living plants, it is leached away, leaving soil lacking in "bases." Even soil formed from pure coral on Tinian has been found under a casuarina plantation to give a p.h. value of 5.5 while, strangely enough, the soil over a volcanic formation on the same island showed p.h. 6. It is possible that the heavier nature of the non-calcarious residue of the

decomposed coral was less well aeriated than the perhaps coarser residue from volcanic rocks. On Ponape a clearing at about 1,500 feet elevation gave the extremely acid reaction of p.h. 3.5 to 4.0. The soil on this area was sodden and had no sub-surface drainage even though it lay on a ridge top. It had been cultivated, recultivated, and then year after year burnt over by hunters to attract the deer and wild cattle and goats to the ashes. These areas and ones similar to them are a warning of the sterility which may come on other islands, as it has already come on a million acres of the hills on the lee side of the Fiji Islands.

Not only lime is lost from burnt over areas, but combined nitrogen, in a form that most trees can absorb, also becomes scarce. Only leguminous plants and trees, which have bacteria capable of absorbing and fixing atmospheric nitrogen in their roots, can grow on such soils. The even hardier casuarina trees, which have a nitrogen-fixing fungus living symbiotically among their roots, grow all over the dry hills of Fiji, and were they not burnt periodically, would in some decades prepare the soil for more exacting species. The loss of this lime and nitrogen, combined with the loss of vegetable fiber in the soil and the destruction of the cool humus layer, soon result in the death of a large proportion of the micro-organisms which inhabit the soil and make it fertile. Grasses whose roots and rhizomes can withstand a surface fire, soon take over the area often to the delight of graziers.

Unfortunately, tropical conditions do not naturally favor grass land. Many tropical weed grasses are not palatable to cattle and therefore multiply while their better cousins are grazed down. Tree and bush species invade the area forcing the grazier to burn the area again and again in his attempts to destroy weed trees and coarse weed grasses. Again, most unfortunately, the coarse grasses withstand fire better than the usefol fodder types. The result

is further and further soil degredation. Controlled grazing on coconut estates is however almost wholly beneficial.

Grass roots are much shallower than tree roots. Because of this, grasses find it impossible to bring up from the deeper soil many plant foods which they need. Grass can follow trees, but trees find it more difficult to follow grass in the poorer grass-covered soils. Weed-bush growth with deeper taproots may be of advantage. It is suggested that, just as rubber planters in Malaya have turned from the unscientific but in appearance good system of clean weeding to "rubber forestry" under which jungle bushes are permitted to grow between the rows of rubber trees, so coconut-plantation managers may find that it improves the yield of their palms if they allow a certain number of broad-leaved dicotyledonous shrubs among their monocotyledonous grasses and palms.

It will probably be found that the "lazy" Malay and "lazy" South Sea Islander, who never weeds his land, is actually a better tropical farmer than the white man, the Chinese, or the Indian who attempts to clear all weeds and leaves the ground "clean" and bare. In temperate climates this would do little harm, but here the soil micro-organisms will be scorched and killed by the heat and the strong sunlight, and the valuable plant foods will be dissolved and removed by the heavy tropical rains. In the tropics, even more than in semi-desert areas, mulching is very necessary.

Shifting cultivation can be adapted to modern needs by a system divided by the Burma Forest Service and known as the Taung-ya plantation system. It is probable that a properly organized Department of Forestry could introduce such a system into these islands to the great benefit of the local economy. Under this system the Forest Officer in charge of an area of National Controlled Forest allocates a block of forest land each year for food cultivation.

He usually chooses a block which has just been logged and in which natural regrowth is scanty.

Cultivators are given family areas in this block and are charged a nominal sum of perhaps $1 per acre. They fell and burn all remaining trees and bushes, then plant their food crops in the area. The local Forest Guard gives them seedlings of valuable trees and they plant these at 10-foot intervals among their vegetables. The farm families, during the slack season when waiting for the food crops to grow, are normally given employment by the Forest Guard or by the local lumber company. When the food crop is reaped the Forest Guard inspects the area and, provided there is a full stocking of the planted tree seedlings growing well, he pays the cultivator a sum of perhaps $5 per acre. If there are no seedlings and the cultivator has not attempted to plant or replant, he is blacklisted and not given a new area the following year.

Some of these islands have been largely cleared by the Japanese colonists. Had watchful farmers remained on such areas, erosion would doubtless have been prevented. As things are, however, there has been severe erosion. These eroded areas will become the first responsibility of a Department of Forestry for these areas need a rest of many decades under forest before they can again be cultivated for annual crops.

TOTAL TERRACULTURE

The word Terraculture means the culture of the surface of the whole earth. It includes the harvesting of the crops of the sea: fishing and the collection of oysters, sponges, kelp, etc. It includes grazing and crop farming. It includes forestry and conservation activities. It includes the preservation of surface and underground-water supplies. Indirectly it controls, and is controlled by mining and industry. If total terraculture is planned by a Committee of qualified technical experts who will insure that the natural resources of the land used to the best advantage then, and only then, can the people obtain the highest standard of living.

In no country in the world is national policy yet directed by a Terraculture Board. Nations are gradually working towards this end and the numerous national "Development Councils" have pointed the way to better living.

The United States has in the Trust Territory a wonderful opportunity to show how even a small land area, developed by American technical knowledge, can become self-supporting with a high standard of living.

Disregarding the possibility of atomic-energy, fresh-water distillation from the sea, it appears that fresh water will be the limiting factor in island development. Full details concerning this are set out in the publication, "Twenty Five Years of Forestry Work on the Island of Hawaii," see page 93. Hawaii has problems almost identical to those which will face these islands. On Hawaii, unfortunately, nothing was done for many years to prevent the destruction of natural resources and as a result much of the island group is barren and heavy storms still send brown mud-filled freshets rushing down wide, normally dry, stream beds to the sea.

It is recommended that the Administration set up a Development Committee consisting of the Director of Agriculture, the Director of Forestry, the

Director of Fisheries, the Financial Adviser to the Government, and the Chairman of the Chamber of Commerce. This Committee could make recommendations to the administration on the funds required to assist development of the various natural resources of the islands. It is appreciated that many of these officers have not yet been appointed, but it is presumed that in time they, or officers with similar functions, will be.

This Committee should consider an all-out effort to destroy the rhinoceros coconut beetle in Palau which now menaces the principal, and in places, the only, economic crop, copra. It should arrange for the rehabilitation and enlargement of the Japanese Experimental Station at Midzuho, Babelthuap, and the planting of para rubber, Hevea brazelunsis in Babelthuap. It should arrange for a Land Use Survey to be carried out by the examination and mapping of all islands, and the classification of all land into the following classes:

1) Level and not subject to erosion.
2) Land, suitable for cultivation, but subject to slow erosion if farmed without due care.
3) Land, suitable for cultivation if plowed on the contour, and if other erosion-control measures are taken.
4) Land unsuitable for cultivation except either for tree crops such as fruits, cocoa, and coconuts, or where terracing has been undertaken.
5) Land not suitable for arable farming because of lack of drainage, salt-water flooding, etc. This land would include, as a special subhead, the mangrove forests.
6) Steep stony land, suitable for controlled grazing, coconut plantations, controlled "Taungya" shifting cultivation, etc.

7) Very steep land which should be kept under a permanent lumber-tree crop.

8) High, steep lands unsuitable for the production of any economic crop. Watershed, watercatchment, and recreational areas.

These are the classes used in the U.S.A. and are excellent for general world standards. It is recommended that officers of the U. S. Soil Conservation Service be asked to make complete reports, island by island, on the land in the Territory. Such a survey by a team of three officers would take at least 6 years. A one-man team is useless as, should he fall sick, or go to America on leave, all work will stop. Such a Land Capacity Inventory is essential before a proper Development Plan can be prepared.

The American personnel at the various administrative stations are fed almost exclusively on frozen food brought from the U. S. A. The Agricultural Officer, Ponape, was specifically forbidden to grow vegetables for the 13 officers and 59 enlisted men on that base. It is recommended that in order to produce a diversified diet for everyone, the Department of Agriculture be instructed to start an Experimental Farm at every administration Headquarters, and that the station quartermaster be instructed to purchase, at current U.S.A. market prices, all vegetables, milk, eggs, etc. produced on the farm. Under these conditions these farms should become almost self-supporting within a few years.

FOREST ADMINISTRATION

This small Territory cannot economically support a large forest administration; indeed it cannot support an administration of anything approaching the size that exists there at present. It costs the American taxpayer over $5,400,000 annually to administer 53,000 people or over $100 per head, or $10,000 to administer a village of 100 people living under primitive conditions.

Though the Forestry staff must be small, it must influence the development of all the island groups and of all the islands. The only way this can be done is by decentralization and by appointing officers to have overlapping functions. At present, as sociological considerations are receiving prior attention, there are on all of these island groups elected magistrates, teachers, and medical assistants. It is of the greatest importance that there should be on each island a trained islander, of rank equal to these other officials, as an Economic Development Officer. This man must be trained in Agriculture, Forestry, and Fishery work. He will be in charge of the Experimental Farm, of the National Controlled Forests, and in addition will give advice and assistance to farmers, loggers, and sawmill-owners and fishermen. He will collect Government taxes due on farm, forest, or fishery activities. He will naturally employ some local natives for work on the farm and in the forest.

It is the object of American rule to teach the islanders to think for, and to govern, themselves and to induce them to consider themselves all of one race, the Micronesians, able to send delegates to a Micronesian Congress. At the same time the islanders must be gradually introduced to modern ways of life and trade. A central authority and a central training school may give the islanders a feeling of being one people, but will not teach them to think for themselves. That can be accomplished only by having all local activities controlled by local councils.

As has been explained elsewhere, it is only when a local peasant population realizes that the retention of forests are to their benefit, that the forests are safe from sabotage. It is, therefore, recommended that the profits from the National Controlled Forests in the island groups be paid to the municipality of that group and that the full statement of receipts and expenditure on forestry for each group be kept separately, and handled by the Group Forest Officer to the Mayor of the Group Municipality.

It is quite certain that for some years this system will not be fully understood by the islanders and that the necessity of forestry control will not be recognized. It is unfortunate that as long as a man is healthy he will take but little care of his health. As long as there are no signs of bad erosion damage, a people will not realize how their forests guard them. School farms and school plantations are excellent, but it would be wrong to ask the Department of Education to do all land-use education work. The children will pay more attention to an expert, a stranger like a visiting Forester.

DEPARTMENT OF FORESTRY STAFF

There is at present no organized group of American Foresters with tropical experience. In view of the increasing need of the services of technical experts all over the world and of the slow but sure integration of American economy, British economy, and the economy of every other nation, it is urged that America organize a Tropical Branch of her Forestry, her Conservation, and her Agricultural Services. Men from such services, when they retire from active duties, could lecture in Agricultural and Forestry Colleges and give to the students a broader view of the world land-use problems.

Without this disseminated knowledge among her people, America will be less well able to evaluate world problems. There is a need too of some Tropical Branch of the National Parks Service to care for the strange ruins of some forgotten race found in various places on these islands. The extensive basalt block buildings on Ponape at Metalanim and elsewhere and the colossal stone pillars of Tinian require guarding, possibly as part of the duties of the local Forest Guard.

It is recommended that there should be appointed three university graduate Foresters, one a senior with, if possible, tropical experience, and two juniors. The provision of three is the absolute minimum that can insure continuity. These officers will all be stationed at the General Headquarters, but will spend much of their time traveling, insuring however that there is always one at headquarters. It would be of advantage if another junior forester could be added to the team and if he could be responsible for Guam.

The office and headquarters staff required for the next five years will be one chief clerk, one typist, one secretary, one account and records clerk, one draftsman.

In the field there should be one Forest Ranger - when there are sufficient trained men available - preferably of island or at least Polynesian ancestry in each main island group. This would mean one in the Marianas, one at Yap, one at Koror, one at Lamotrek, one at Truk, one at Ponape, one at Kusaie, and one in the Marshalls.

In addition there should be three or four Forest Guards under each Forest Ranger.

It will be impossible to obtain these men at present. Forest Guards should be chosen from boys who have done well in their school examinations and have proved their capacity by at least a year's work in the fields under a Forest Guard or Forest Ranger. Their subsequent training before promotion to Forest Guard is dealt with in the following pages.

INTERNATIONAL COOPERATION

The writer is most appreciative of the great honor which has been done him in asking him to undertake this Forestry Survey, and he feels that there is so much to be learned as well as to be taught in similar international exchanges of technical personnel that he suggests that full advantage be taken of similar possibilities in the future government of the Trust Territory.

It is already the custom for medical students to be sent from American Samoa and from the Trust Territory to the South Pacific Central Medical School in Suva for training. The writer, when Conservator in charge of Forestry in Fiji, started a Forest Research and Training Center at Colo-i-Suva. This school was not restricted to Fijians, but also trained Solomon Islanders, and arrangements were in hand to accept students from Tonga, from Western Samoa, and from American Samoa. It is suggested that a similar agreement might be approved for students of the Trust Territory to be trained in Fiji. This school takes students of the Forest Guard grade only. The training includes presmatic compass surveying, and map making, elementary geology, forest management, forest nursery and plantation procedure, sylvicultural treatment of logged forest, mangrove management, log and lumber measurement and volume calculation, forest cruising, etc.

It is recommended that after 10 years' practical experience a Forest Guard considered suitable for promotion could be sent to the higher Forest School at Kepong, Federation of Malaya. This latter school might be utilized also to train young men with higher educational qualifications to be Forest Rangers.

It is suggested that it would be of great mutual advantage if a young American university graduate forester, after appointment to the Trust Territory Forest Service, could be sent to work for a year in Malaya as a member of the

Malayan Forest Service. Such arrangements were made during the war between the American and the British Navies, Armies, and Air Forces. Surely in these days it would be simple to arrange for a similar transfer of civil servants.

The Malayan Forest Service, the Hawaiian Forest Service, and the Fiji Forest Service could assist the Trust Territory Forest Service by the provision of seeds and seedlings of trees with known rates of growth and known lumber characteristics.

FINANCE

The Department of Forestry will require financial support for the first 50 years of its existence, but should after that not only be self-supporting but should also make a substantial annual profit. There is no reason why the United States taxpayer should make a gift to the Micronesians of the money required to establish a lumber-growing business. It is recommended, therefore, that all sums spent shall be debited to an interest-free loan account, to be repaid as soon as possible, and that a taxation system be devised to obtain revenue from all forest products.

It will be appreciated that there are at present very few sources of forest tax. The building poles and firewood taken by villagers cannot be taxed; first, because these people have been accustomed from time immemorial to obtain such forest products from the land and they therefore have acquired a legal "right" to obtain such products; secondly, because they obtain the wood from land which is in equity their tribal land; thirdly, because it would cost more in Forest Guard salaries to collect the tax than the tax itself would produce; fourthly, because the villagers, feeling that they were being unjustly charged with a new tax, would resent the tax very much.

The case will be very different however, when commercial enterprises are concerned. The lumber which passes through a sawmill or the charcoal produced by a kiln, can be taxed with ease and justice.

The major source of revenue will, however, be the taxes paid to Government, royalty paid to the landowner, and cess paid to the Department of Forestry, on all lumber produced from plantations in National-Controlled Forests. Naturally where the landowner is the Government of the Trust Territory, it will get both tax and royalty. Where the landowner is the suggested Reparation Estates, the Government of the Trust Territory would get the tax and the Reparation Estates the royalty.

The estimated annual cost of a Department of Forestry for the first 10 years is as follows:

	Year 1-4	Year 5-9	Year 10	After
Director of Forestry	$12,000	12,000	12,000	
2 Foresters (starting at $5,000 each)	10,000	12,000	14,000	
Clerical Staff (starting at $3,000 each)	15,000	16,000	17,000	
Forest Rangers (starting at $2,400 each)	-	2,400	9,600	
Forest Guards (starting at $1,200 each)	6,000	18,000	30,000	
Traveling Costs	10,000	12,000	15,000	
Nursery Labor	5,000	7,000	7,000	
Field Labor	5,000	10,000	10,000	
Plantation Labor	5,000	10,000	20,000	
Materials	5,000	5,000	5,000	
Total Expenditure	$73,000	104,400	139,600	150,000

Revenue will be under $1,000 per year for the first 5 years; thereafter it will rise until after 50 years, when the plantation crops are harvested, it should cover all costs and produce a profit.

It would be foolish to prepare a set of figures when the intrinsic value of all units of currency, including the dollars, is falling so rapidly, in terms of "one unskilled laborer's pay for one hour's work" - which is the only real unit of measurement. It is everywhere recognized that lumber and wood in any form are becoming more and more scarce and that any effort to prepare supplies for the future are not only of benefit to the country concerned, but will yield a profitable return. Mr. G. M. Hunt, Director, Forest Products Research Laboratory, Madison, Wisconsin, who was the guest delegate from the

U.S.A. at the Fifth British Empire Forestry Conference, held in 1947, said there that, "Wood as a raw material for industry and commerce has a brilliant future before it. It is up to Foresters to grow more of it, so that the world can increasingly enjoy its numerous advantages."

In the same Conference it was noted that: "It was stressed that one of the most frequent causes for a breakdown in working plan prescriptions was the failure of government to provide funds. The forest budget is usually one of the first to be raided in times of depression because no Government has yet realized the importance of a regular provision of funds for forest management." It is hoped that this criticism will not be applicable to the Trust Territory. Under Naval Administration, the Agricultural Officer did not have control of the sums to be spent on Agriculture. It is hoped that he will have in the future and that the Director of Forestry will likewise have full control over his departmental expenditure.

SUMMARY OF RECOMMENDATIONS

It is recommended:

1) That the Administration of the Trust Territory should publish a "Forest Policy of the Trust Territory" on the lines laid down on page 10.

2) That a senior Forester with tropical experience be appointed Director of Forestry.

3) That one junior Forester be appointed and sent to a British tropical Colony, preferably to Malaya, to gain experience in tropical forestry for one year, and that at the end of that year this Forester return to the Trust Territory to work under the Director of Forestry while another junior Forester be sent to Malaya for training.

4) That five youths, who have passed the highest local school examinations and have been passed as suitable after two months' work in the Agricultural Station, be sent to Fiji for one year's training.

5) That the best native clerk of some 4 years' service be sent to work under the Director of Forestry with a view to being sent to Malaya for training as a Forest Ranger.

6) That a Development Committee be set up as laid down on page 31.

7) That a Land-Use Survey be carried out according to the lines laid down on page 32.

8) That all former Japanese land be constituted a Reparation Estate, acknowledged to be the property of the U. S. Government, and be put under a practical plantation manager to be run on commercial lines as suggested on page 23.

9) That a law drafted by the Director of Forestry allowing for the dedication of land be passed.

10) That a full and complete survey and inquiry into all land ownership, usufruct rights, and land-boundary claims be carried out by qualified surveyors, as described on page 18.

11) That a statement on the Policy of the Government in regard to the land-ownership system be made and published widely among the islanders.

12) That in future budgetary provisions a large proportion of the sums to be spent shall be applied to items which will in time render the Territory self-supporting, and that for this reason Agriculture, Fisheries, and Forestry shall be adequately financed.

13) That the Island Trading Company be instructed to consult with the U. S. Forest Service and to decide which type of sawmill is most suitable, and arrange for such sawmills with steam-power plant to be sold on hire purchase terms to suitable local inhabitants, or to arrange to run such mills themselves at their various stations.

14) That at all Administration Stations the Department of Agriculture will start Station Farms to produce vegetables, eggs, milk, and meat for the station and also make experimental plantations of suitable trees.

A DESCRIPTION OF THE ASPECTS OF GOVERNMENT WHICH ARE COVERED BY THE FULL OPERATIONS OF FORESTRY

The writer has set out below a few brief notes on Forestry and the work of a Department of Forestry. In recent years and especially in the United States the functions of the Department of Forestry have been circumscribed and various sub-parallel departments have been created, many employing foresters on their own staff. Of these, Soil Conservation, the National Park Service, Wild Life or Game Services are really but different functions of Forestry.

Forestry is the science of obtaining from all land, not being used for permanent crop farming, for mining, or for some urban project, the maximum benefit for the owner, year by year, in perpetuity. Forestry thus covers the growing and harvesting of timber, the guardianship of the natural resources of water, of wild life, of natural recreational areas, of marginal lands which can be used either for controlled grazing or for farming under a long-term, tree-fallow system. Forestry is responsible for insuring that the timber lands of the national shall continue to produce, in approximately equal annual amounts, a sustained yield of timber for the national requirements, while at the same time insuring that this harvest of a renewable natural resource shall make an adequate tax contribution to the national revenue.

Foresters are trained to consider, not only the day-to-day expedients of ordinary life and commerce, not only the year-to-year price variations of the farmer whose crop matures in from 3 to 8 months, not only the 50-year amortization period of the civil engineer, but also the century-long process of soil rehabilitation, the two-century-long growth of a hardwood tree, the five-century-long plan of soil formation, of erosion, flood, and even of climate control and so of producing for the population, that will exist in the year

2,500, a better world than uncontrolled, unwise, and even at times thoughtless and selfish operations have produced for us today.

At the same time the forester, if he has served for a number of years as a government servant, will realize that the deadening effects of detailed bureaucratic control can never match the efficiency of individual initiative. He will realize that no orders or regulations can succeed unless the local inhabitants are themselves in full accord with the regulations, which they themselves must have assisted in drafting. A forester's study of the interests of the owner of a tract of forest land will lead the forester to realize that over that forest various individuals, or groups or even the nation at large, also have certain rights similar to ownership. It is then his duty to state clearly the exact extent of any and every right over that forest.

This Forestry Report endeavors to lay down the activities of a Department of Forestry for the Trust Territory under the following headings:

(a) In cooperation with the Agricultural Farming and Dairy Experts and the Water-Supply Engineers, to assist in drafting a Land-Utilization Policy and implementing the resulting Land-Use Plan.

(b) To prepare, in conjunction with the Agricultural Farming and Dairy Experts and the Legal Experts, the laws necessary to prevent damage to all land whether publically, communally, or privately owned, when such damage is caused by rain erosion, wind erosion, river or sea erosion, or by fires.

(c) To give to members of the public any advice or assistance necessary to enable them to prevent any erosion or loss of any natural resource.

(d) To manage all permanent forest areas legally placed under the control of the Department in such a way that these forests will give in perpetuity the maximum sustained yield of optimum quality and

optimum value timber, and moreover to advise and assist members of the public similarly to manage their forests.

(e) To conduct research on and make information available to the public on all forest produce or timber grown locally or suitable for being grown locally.

(f) To collect for the Government, as a source of Internal Revenue, and as a means of defraying departmental expenditure, tax on all timber cut and in addition to collect, on timber cut from forests under departmental control, a royalty for the owner of that piece of forest.

(g) To collect and keep statistical records of the total amount of each type of timber, firewood, or other forest produce present, and/or removed from the forest, in order to make such plans and arrangements as will insure that there shall always be available a sufficiency of timber for the population and for the demand that will in all probability be existent when the tree crop matures in perhaps 90 years.

(h) To make the necessary legal arrangements to obtain permanent control over, but not necessarily ownership of, such areas of forest land or of other land rightly under the control of forestry in order to insure:

(i) The protection of catchment areas of water-supply schemes or of hydro-electric schemes;

(ii) The prevention of erosion on very steep slopes or at the head-waters of streams;

(iii) The production of an increased emergency supply of timber to enable the country to obtain an adequate temporary supply of timber in the event of war or of such similar emergency;

(iv) The rehabilitation of marginal land degraded by previous unwise agricultural practices;

(v) The commercial production of timber to satisfy the needs of the nation for domestic supplies or for export;

(vi) The production of an economic crop of timber on land not economically productive under prevailing rates of interest when such land can be used for no other purpose;

(vv) The protection of natural scenic areas and their management to insure that they are not ruined, but rather made available for all members of the public;

(viii) The protection of all forms of wild life to insure that future generations may enjoy them, and also to insure that unwise interference with the balance of nature shall not work to the detrement of the nation.

Tree planting is not forestry. In general, except to introduce new species, a forester who plants has failed. He has failed "so to control the environment that Nature herself is willingly reclothing the land with the desired species free of cost." He has failed because the costs of manual planting calculated at compound interest for the period of the list of most trees, at the rates of interest now current, will leave little if any profit in the operation.

Planting may be necessary, but, if it is, a wise forester will endeavor to obtain from the marketing of the brush, firewood, or timber now on the ground or from the leasing of the right to raise a catch-crop between the rows of planted trees, a sum sufficient to cover the cost of planting and of early tending operations. A trained forester is always constrained by thoughts of costs at compound interest. It would be simple for the writer to advise a dazzling scheme of forest development without mention of costs or markets, but it would not be honest forestry, and it would unnecessarily burden the American taxpayer.

In considering the financial aims of national forest management, there are two schools of thought. According to one the forest should be managed, and both taxes and royalties adjusted, so that the lumber will sell at a price which will enable it to undersell similar imported lumber by a small margin. Under this system the Government will receive large direct profits from its forests, the Department of Forestry will have but little difficulty in obtaining adequate funds for the following year's expenditure, and Government will, because of the profit from its forests, be able to reduce other tax burdens on the community. According to the other school of thought, however, the rates of tax and royalty should be reduced until the forest estate of the nation produces the minimum of profit and just pays the costs of management. It is held that under this system the indirect benefits of a supply of cheap lumber will be more than repaid by the increased direct taxes paid by prosperous industries using this cheap wood.

Naturally these two concepts can be modified by the imposition or withdrawal of customs duties on imported lumber. Under no circumstance is it considered desirable to contemplate any permanent subsidy not capable of liquidation by anticipated future economic returns or by some equally important indirect benefit. If an expenditure greater than the immediate revenue is anticipated, the forester must make quite clear what the future gains will be.

It is the duty of the Legislature then, not of the forester, to decide what action should or should not be undertaken and what financial policy shall guide the actions of the Department of Forestry. The Forest Policy of a country is therefore the policy of the Government, not of a Department. It is the aim of this report to furnish non-technical legislators and administrators with a draft Forest Policy, with all the reasons that render such a policy desirable, while at the same time including such information and advice as will enable a trained forester, unaccustomed to tropical forestry, to carry out the Policy.

METEOROLOGY

It is difficult to advise on the most suitable tree species to introduce as a plantation crop until more detailed information on the climate of these islands is available. Still more is it impossible to decide on the best local race and local source of seed of any species chosen. It is not difficult now to name species which will grow; what is impossible is to do more than guess which species from which locality will give the maximum return. A tree crop takes many decades to reach maturity, and one local race from the wrong area, when once planted, not only can not economically be cut down, but also, will by cross pollenization degrade the seeds from a neighboring plantation of the right race.

There are at the Ponape Agricultural Station, and there must be somewhere in Japan, full records of meteorological data collected during the Japanese regime. It is strongly urged that some Japanese meteorologist be employed to correlate this information, and that the results be made available as soon as possible.

The writer is not a meteorological expert, but must call attention to a condition of affairs in these islands, in the South Pacific generally, and indeed in the whole world. This is the dangerous tendency of assuming that meteorology is concerned almost solely with the navigation of aircraft and that the collection and the dissemination of meteorological data is a function of the Air Force or of a Civil Air Authority.

The result of this recent concept is that "average" figures are used, and that it is impossible to obtain records extending far into the past.

In Pago Pago, the Meteorological data now being collected by Mr. J. B. Menardi of the Hawaiian Sugar Refinery Experimental Station is of far greater permanent value than that collected at the Government Station. He records,

interalia, on an automatic recorder the rise and fall of atmospheric humidity. It appears that this is always approximately 100% at night and drops as the sun rises to as low as 53% on a dry clear afternoon. A daily maximum-minimum humidity record would be of some use while the present "average" figures mean nothing from an agriculture-forestry point of view.

The amount of sodium chloride deposited on a given area of ground either as dried spray or dissolved in the rain, would be of interest. The records of an automatic rain gauge showing the maximum rate of precipitation is of the greatest importance in planning an anti-erosion land-use and land-acquisition scheme for hill country. Soil temperature thermometers, set at various depths and in various soils, black-bulb radiation maximum-minimum thermometers, sunshine recorders, and numerous other instruments not directly of interest to aircraft meteorologists, should be introduced on the advise of a practicing agricultural meteorologist.

The writer has been unable to obtain a continuous record of rainfall on any station over a period long enough to be significant. Unfortunately, owing to lack of a full appreciation of the wide needs for meteorological information, the collection of data in Pago Pago was discontinued during the recent war, and records were obtained from the airfield at Tafuna with quite different madroclimatic factors. The Pago Pago Station is situated in the Pago Pago Bay rainshadow in the lee of a 1,700-foot high bluff known locally as Mt. Pioa, the Rainmaker. The South East trade winds laden with moisture strike Mount Pioa and are driven up the slopes dropping the standard 3° for each 1,000 feet of rise, or over 5° in all. On passing over the summit these supersaturated winds form clouds and drop their precipitation into Pago Pago Bay. Tafuna airstrip is on the other hand built partly on the fringing coral reef over two miles from the nearest hills on the windward or South East side of the island.

There is therefore not the slightest inducement for orographic rain to fall on the airfield. Similarly the Apia (Western Samoa) Meteorological Station is situated in a dry area on a sand spit over 4 miles from the hills on the lee of that island. For this reason rainfall records of Pago Pago and Apia, though often compared, are not in the least comparable.

The records of the Pago Pago rain throughout the years show that apparently the South Pacific weather has a 33-year cycle of rainfall moving from a time when annual variations are small, around 1905-07, moving rapidly to a maximum period of either annual floods, or annual droughts around 1910, and then gradually subsiding to a period of minimal variation about 1938, and then starting a period of violent fluctuations again. Unfortunately, it is at this point where the Pago Pago records became unavailable. As it is generally recognized that there is a rapid global tendency towards milder weather and the dimunition of glaciers and arctic and antarctic ice, and as the atolls' populations depend for their existence both on a precarious water supply and on a relatively small rise and fall in mean sea level, it is urged that this subject receive urgent study. On it depends the land policy, not only of the atolls, but also of the high islands so obviously destined to receive atoll immigrants.

TREE SPECIES TO BE USED IN PLANTATIONS

In choosing trees to plant it is urged that the species native to the island should, in every case, be preferred to introduced exotics. It is true that, owing to their isolation, the choice of indigenous species is limited, but we can be sure that indigenous species can resist indigenous pests and are known and used by local inhabitants. At the same time, as in places the use of exotics will be essential, the writer urges that the excellent book, Twenty Five Years of Forestry Work on the Island of Hawaii, should be consulted and its advice followed.

When nurseries and plantations are started, it is desirable that some standard name should be allocated to each species used. This name should on no account be the "South Sea Mahogany" or "New Guinea Teak," names beloved by construction gangs, but most detrimental both to commerce and to the reputation of timbers which have their own good qualities deserving of recognition. It is suggested that some South Pacific name should be used by agreement between the various national departments of forestry concerned.

The following South Sea species deserve consideration as lumber-crop species:

Scientific Name	Suggested Standard South Pacific Name
Agathis vitiensis	Fiji Kauri
Podocarpus vitiensis	Salusalu
Araucaria bernieri	
Calophyllum inophyllum	Coastal Tamanu
Calophyllum sp.	Inland Tamanu
Intsia bijuga	Ipil

Casuarina equisitifolia	Ru
Myristica castanaefolia	Mali
Gyrocarpus jacquinii	-
Carapa obovata	Dambi
Endospermum macrophyllum	Kauvula
Eugenia (Hard species)	Asi
Sideroxylon (Hard species)	Sethau
Guettarda speciosa	

The following exotic species will probably do well, but should be planted now in small blocks in Agricultural Plantations to insure a supply of seed. Climatic factors should be carefully considered in choosing the locality of seed source:

Scientific Name	Popular Name	Description
Tectona grandis	Teak	The best boat and ship-building timber in the world.
Swietenia macrophylla	Large leaved mahogany	An excellent furniture wood.
Ochroma lagopus	Balsa	A very light wood used for aircraft construction.
Shorea glauca	Damar laut	A hard sea-shore hill species found in Malaya.
Coedrella mexicana	Cigar-box cedar	Fine-grained light timber.
Albizzia falcata	-	The world's fastest growing timber from the Moluccas Island
Pinus caribbea	Slash pine of Florida	Hardy, fire-resistant, fast-growing pine. (Note: The introduction of the correct mychorrhiza with the seed is necessary.)

SAWMILLS

There are at present on all the main islands pieces of machinery, the wreck of war, in various states of disrepair, but flattered by the name of "sawmill." These machines are costly to operate or to repair. They are made partly of American and partly of Japanese material. If sawmills are to function, as they must, it is imperative that the sole importer, the Island Trading Company, should standardize on one make and on one design.

The writer suggests that a mill should be standardized with a main breakdown saw, with the proviso that it may also be used to produce planks directly from the log. The mill must also have an ordinary saw table for resawing, a double surfacer (4 sides), and a "swing saw" for crosscutting the planks. The sawmill experts should appreciate that the lumber cut will vary, log to log, from harder than oak to soft lumber like aspen. The operators will not be able to tension a saw and will cheerfully overload any equipment. After running a bull-dozer for a day without any oil in the engine, the operator will, in New Guinea and probably here, innocently report, "Him engine no good, something wrong him belly." For this reason the saw blade must run in a spray of water, a standard South Sea Practice. For this reason too a strong blade with replaceable inserted teeth is advised for the large expensive saw.

It is advised, when the type of mill is standardized, that the best sawmill operator in the island be permitted to buy a complete mill on the installment plan, or, if no suitable mill manager is found, the local Island Trading Company manager should erect and operate the mill, making a charge for sawing up any logs brought to him.

These mills must not be operated by an imported fuel. To an American, nurtured in an oil, electricity, highly mechanized, surplus economy, it may seem a retrograde step to insist on the installation of steam power produced

by burning the sawdust and mill waste, supplemented by branchwood from the felled trees. It may seem primitive to suggest the erection of flumes and undershot wooden water wheels to obtain energy from the fast-flowing streams of Babelthuap, Ponape, and Kusaie, or to suggest the use of a pelton wheel at Melalanim coupled by belts directly to the layshaft of the sawmill. It must not be forgotten that to bring to these islands oil from Texas, while ignoring local fuel and local sources of energy, is not rational. The transport of such oil in times of war would be unnecessarily hazardous or even impossible.

It is advised that the complete sawmill unit including steam boiler be designed by the United States Forest Service and that one mill be sent out to Ponape to run under the supervision of a U. S. Forest Service Operator for at least a year before control is handed to the I.T.C. manager or to someone like Mr. Kennedy. Before the purchase of a similar mill elsewhere is permitted, the future operator of the mill, and at least three workmen, should be brought to Ponape, at the expense of the Department of Agriculture and Forestry, to work for two months in the Ponape mill. The new mill should be licensed for operation only after its erection has been approved by the Director of Forestry and Agriculture or his accredited agent.

MANGROVE CHARCOAL KILNS, MANGROVE-BARK EXTRACT FOR TANNING AND LIMEKILNS

The Japanese organized the production of charcoal using local labor. They used locally made brick and mud beehive kilns averaging 15 feet in diameter by 10 feet high. In this way naturally the by-products are wasted but, considering the small areas of mangrove available at each place, any more elaborate carbonizing equipment or more highly skilled supervision would not have been economical.

The local production of charcoal for export continued for some time after the Japanese surrender. Recent political events in China have closed that market, while an administrative order has closed the much more important Japanese market. Because the Japanese cannot obtain charcoal from these islands they are over-cutting their own forests for much needed domestic fuel. Japanese houses are designed for heating and cooking by charcoal. Coal and oil cannot serve as substitutes. In spite of this, some official in the Allied Control Commission in Japan has, according to information received, ruled that charcoal may not be imported into Japan "as it is not a raw material, but a semi-manufactured article that can be produced in Japan." At the risk of causing offence, it is important to the economy of the Trust Territory that this decision be reversed at an early date and that the Island Trading Company recommence the purchase and export of charcoal to Japan.

The type of kiln used is satisfactory provided that it be kept in continuous operation. The cycle of work should be as follows:

Day 1.	Load the kiln, brick up the entrance, start the fire.
Day 10.	Close lower vents about this date when the color of the smoke issuing from them changes from white to blue.
Day 21.	The top vents should be just changing to blue smoke and the whole kiln should be sealed.

Day 2 to day 28. Collect and stack enough wood to refill the kiln.

Day 28. Open the kiln entrance and all vents. Empty the kiln. Refill the kiln, seal up and start the fire again.

It is important that the kiln should be emptied and filled in one day, in order to keep the temperature of the kiln body high and secure a good product. If the kiln cools, it may crack. For this reason, only a kiln run by the private enterprise of men having a financial stake in the operation, will be successful.

When mangrove wood is cut for firewood, charcoal, or lime burning, it is advisable both from the point of view of efficiency and economics to remove the bark and stack the billets to dry in the sun and the wind. The bark that is removed can be crushed, then boiled in fresh water to extract the mangrove-bark tanning extract or cutch. This extract is becoming scarce on the world's markets and is rising in price. The controlling authority must, however, keep an eye on cutch makers, or the firewood used in boiling the bark will outweigh in royalty and value the cutch produced. It may in time, when more cattle are kept on these islands, become a practical proposition to emulate the tanners of Singapore who tan hides using a cold infusion of mangrove bark in a concrete-lined pit. The operation, though simple, requires practical knowledge, and when, or if, it is attempted the services of a Singapore Chinese tanner should be obtained for six months as an instructor.

Lime. The Japanese lime kilns on Babelthuap apparently used wood fuel. A mixture of wood and charcoal (the small-sized waste charcoal not normally saleable) would be better. The lime is prepared by collecting coral, leaving it in the rain for a few weeks to wash off the salt. Then the kiln is filled. First at the bottom is a mixture of small twigs and kindling; immediately above is a layer of small branches, and then some large pieces of wood, longer than the width of the kiln, arranged diagonally across the kiln to prevent the

kindling being crushed. Directly above this the kiln is filled with a mixture of dry block coral, and pieces of dry wood in the preparation by weight of one of coral to two of dry wood, plus, sometimes, one of charcoal.

The kindling is lighted early one fine morning, and the kindling fire kept up with fresh wood until the whole inside of the kiln is afire. Then as the mixture of coral wood and charcoal burns, it will sink down. More of the same mixture should be thrown in from the top at intervals until the accumulated lime at the base of the kiln threatens to cut off the drought. Raking out the still hot quicklime often renews the draught. When finally the draught slackens, the kiln is left to burn out and the lime is removed from the base of the kiln and stored in sacks under cover or slaked first, and then stored.

If it were possible to revive this industry of lime burning, the Trust Territory would be able to reduce or nearly eliminate the present practice of importing cement. There can never be a lime-export trade, but the elimination of unnecessary imports is economically most desirable.

SAIPAN, TINIAN, AGUIJAN AND ROTA

Latitude: 13° 40' to 15° 40' North

Longitude: 145° 35' to 146° 0' East

This area was visited by the writer from 24 November to 5 December 1950. Saipan is 47.46 square miles in area, 12.7 miles long by 5.5 miles broad; Tinian is 39.29 square miles in area, 10.5 miles long by 5 miles broad; Aguijan is 2.77 square miles in area, 2.5 miles long by 1 mile wide; and Rota is 32.9 square miles in area, 10.5 miles long by 3 miles broad.

Population : The population has been growing at least since 1920 and is now increasing rapidly having reached 6,389 in 1950. This is not nearly the limit of population, as the Japanese, who had developed these islands extensively, had a civilian population of over 43,000 on these islands before the war. During the war Tinian became a vast airbase, and it is from the 8,555 feet long airstrip here that the atom bombs were flown to Hiroshima and Nagasaki.

Land-Holding System. In 1698 these island were completely depopulated by the Spaniards who moved the people to Guam; they however slowly moved back, but have by now to a large extent lost all real interest in tribal-land holdings.

These islands are pracitcally destitute of any real native forest growth, but in them the abandoned land formerly cultivated by the Japanese has been colonized by the introduced Leucaena glauca, the planted Madras Thorn, Pithocolobium dulce, the Acadia koa of Hawaii, and the Formosan Koa, Acacia confusa. There are a few areas of mangrove on the coast.

The soil, almost exclusively formed of the insoluable mineral content of the original coral limestone has, in the surface layers at least, lost any sign of excessive lime showing a p.h. value of 6.0. It was interesting that over an area of volcanic rock on Tinian the soil showed a slightly more alkaline reaction indicating a p.h. value of 6.5.

Rainfall averages 82.2 inches a year and is much heavier from July to October, when it averages over 10 inches per month instead of the 3-4 inches normal during the rest of the year. Saipan is at the northern edge of the typhoon belt.

Agriculture. The Japanese had developed these three islands to a remarkable degree. Their peasant farming population, numbering 40,000, were raising sugar from which alcohol was being produced. The refinery and distillery were destroyed during the war and the sugar-cane fields are being allowed to revert to scrub and have become a severe fire hazard, partly because the natives deliberately fire these abandoned cane fields to destroy the giant snails (Achatina fulica, Ferussac), and the rats which have over run these islands. The sword grass, Miscanthus floridulus, which has spread over the islands, is another fire hazard.

Owing to the heavy demand for vegetables and fruit in Guam, these islands have a chance of developing a prosperous truck gardening and dairy farming economy, but only if the preeminent needs of the Department of Agriculture are recognized.

The Agricultural Experimental Station should be enlarged and should have a firm order from the Navy Quartermasters Department to supply all green vegetables, fruit, dairy, and meat needs of the Administration Staff. This Agricultural Station would serve as a demonstration area to teach the locals how to do efficient tropical farming. The station would naturally be the site of the Forest Nursery, and the superintendent would experiment with the introduction of tropical-tree species, for fruit and lumber.

Water. Though in the future, water will become the limiting factor in the development of these islands, it would be advisable to insure that the permeability of the soil in hill regions is not reduced by the elimination of

the surface soil in erosion. This can be best accomplished by constituting steep hill lands to be National Controlled Forest areas. The monthly flow of the "Donnay Springs," a potentially important source of Saipan's water, should be measured over a long period and correllated with the monthly rainfall. It would be of advantage if the catchment area above these springs could be constituted a National Controlled Forest.

Sawmills. There are no sawmills on the island. The local sawmill is a portable saw-table.

GUAM

Latitude: 130° North

Longitude: 145° East

This island is politically separated from the Trust Territory, but is so inexorably unified by nature with those areas that in the end common sense will doubtless override politics and this island will be administered with the Trust Territory. For this reason it is mentioned in this report.

Guam has a length of 30 miles, and a breadth of from 4 to 8.5 miles with a total land area of 206 square miles. It is, like Saipan and Tinian, of coraline-atoll formation raised during two or more successive periods of uplift to its present status of an apparently high island, rising in Mt. Lamlam to 1,334 feet. It has apparently a core of igneous or metamorphic rocks which show in places at the surface.

The population is 24,268, not including American military personnel who in July, 1947, and probably to-day, number 55,000.

Imports exceed exports by about four to one. The natives gain their livelihood largely by working for, or managing shops, bars, and driving taxis for the American forces. The United States has been extremely generous in making payments to the local inhabitants for any losses they may have suffered on account of the war.

The island is not self-supporting in fruits, vegetables, or timber. The hills are dry-eroded and largely non-productive. It is strongly recommended that a large afforestation program be commenced in order to give Guam an export crop and to make it a source of timber supply to any rehabilitation, assistance, or military project the U.S.A. may in the future undertake in "South Asia." This export crop will be of great value to the islanders if they should ever have to live on their own resources.

YAP ISLAND GROUP

Latitude 9° 27' to 9° 38' North

Longitude 138° 4' to 138° 12' East

This group of islands was visited by the writer 30 October to 6 November 1950.

The island group consists of four large islands - Yap, Tomil, Map, and Rumung, and a number of small islands of plutonic metamorphic and sedimentary rock surrounded by a fringing coral reef with lagoon areas and an imperfect barrier reef. It has a total length of 15 miles and a maximum width of 6 miles. The total land area is 38,670 square miles or 24,749 acres, according to an admittedly rough survey. Of this area we may assume that 1,749 acres consist of mangrove forest, 5,000 acres are under permanent village mixed tree crops, 8,000 acres are under secondary scrub forest, and 10,000 acres are covered with coarse grasses, reeds, and ferns, swept by annual fires, with acid-degraded soils, and in places showing the red erosion scars of sterile mineral soil. There are no primary forests. The maximum elevation is 585 feet.

Rainfall is well distributed, averaging 126 inches per annum. Monthly variations are large. Every month has had a rainfall of under 6 inches and yet, with the exception of March and April (14 inches and 13 inches) every month has had over 19 inches of rain. Rain is said to have fallen to the extent of 13 inches in 24 hours on one occasion.

The temperature ranges from 67° to 99°. The islands are in the typhoon belt. Meteorological data is scanty.

The only tree species of any value for sawed timber is a species of Calophyllum (possibly Calophyllum inophyllum, Linn.). This is recognized by the natives who leave such trees standing when engaged in clearing for shifting cultivation.

The former Japanese airstrip and the land adjacent to it are pock-marked with bomb craters. This area, totalling 500 acres or 1% of the total land area of the island, must be restored to a cultivatable condition by the use of bulldozers or it will not be available for agriculture in centuries. In addition the craters form breeding grounds for mosquitoes. The method of restoration without laying an unnecessary financial burden on the United States taxpayer has been discussed earlier in this report.

The population has shown a most satisfactory increase since the U. S. Navy assumed control. It appears that the Yap people, in the past a proud warrier race of daring seafarers, had lost heart under the repressive rule of the Spanish, Germans, and Japanese. They appear to be recovering their spirits again, and, if they can be given an incentive, a dream, or an aim in their national life, they may yet become able to take their place as equals in the modern competitive world.

It may well be that a plan for the full development of all the potentialities of the Yap islands, if fully understood by the people, and if administered under the supervision of the Yap Council, will be the necessary incentive. The descendants of men who sailed without compasses in open outrigger canoes to the Palaus, 250 miles distant, and brought back as trophies their huge stone coins, must be able to become the equal of any Polynesian race, provided they are given the labor to exercise their skills and initiative.

The financial position of the group is satisfactory at present but is basically unsound because there is not sufficient production of primary products to cover the cost of the great increase in imports necessary to raise the standard of living of the islanders. More than that, the natives have been taught by the Japanese to eat rice and to smoke imported cigarettes and tobacco and, not like the natives of Malaya and other races, to grow these

products themselves. The Navy, with its very large staff of administrative personnel, supplies free medical, police, and to a certain extent, educational services. When this is withdrawn the island will need a subsidy from the U. S. taxpayer in order to remain solvent.

Water. There are at present 15 shallow wells in the lowland areas, but no arrangements have been made to obtain adequate piped water from permanent catchment areas. The Naval establishment at Colonia (or Yaptown) still relies on distilled water during the dry months. This is simple, but is not economical. In California it has been calculated that it costs $400 to produce 1 acre-foot of water by distillation against a maximum of $50 to produce the same amount of water from an immense system of dams, catchment areas and canals. Water will be the limiting factor in the development of this island.

The Rhinoceros Beetle. The beetle has not yet appeared on Yap, but because natives and non-technical whites cannot be trusted to take proper quarantine measures, this pest of the coconut tree will certainly appear in this group within the next decade, as it is already prevalent in the neighboring Palaus.

It is noteworthy that there is abundant evidence, in the fine roads and causways running along the coasts and through the mangrove areas, that the people of Yap did, and could in the future, carry out hard manual labor for the public good. The densely inhabitated Nif-Gorror Peninsula area on the southern end of Yap island, the Okau-Adeueh village area on the west coast of Yap, the Lebinao village, the Gatschapar all had wide, clean paths and solid hand-laid stone foundations for the causways. All that is needed is a leader with drive and direction. The people will learn and, in time themselves supply, the drive and leadership. For the present, American leadership in development is essential. On other islands there has been a greater admixture

of more energetic blood from "Boston" whalers, and their descendants furnish energetic leaders in the hereditary ruling families. This development did not take place here, for the fiercer Yap warrior race did not offer the same hospitality to sailors as did other islands.

Earlier in this report the various terracultural requirements of the Trust Territory have been laid down. Of these the most urgent are for the Yap group, the following:

1) The provision of a piped-water supply for Yaptown and the necessary dam and forested catchment area.
2) The establishment of a "Station Farm" on land formerly leased or owned by Japanese nationals near Yaptown, for the purpose of providing fresh milk and green vegetables for the hospital, the local schools, and the administrative staff, at the same time giving the natives a chance to "learn by doing" the best principles and practices of tropical agriculture. The local labor, which worked on the Japanese dairy herd of 50 head and the vegetable gardens the Japanese cultivated, could be recruited again.
3) The erection of a sawmill to be owned and operated by the Island Trading Company.

There is in Yaptown a small joinery unit with a circular saw. This is engaged in cutting up baulks of timber left over from the war, a procedure most wasteful in time and electricity. At Rumu there is a derelict Japanese mill consisting of a bandsaw and a breast-bench, driven by a Japanese single cylinder semi-diesel engine of an estimated 15 h.p. at 480 r.p.m. The circular saw blades are typical Japanese, thin-spring set and impossible to use unless they are kept properly sharpened and tensioned and run at the designed speed. A skilled Japanese could run the mill economically, but not an untrained local. The strangest of all things seen at the mill is a log, apparently of Cryptomeria japonica brought here from Japan to be sawed up.

PALAU GROUP

Latitude: 6° 50' to 8° 20' North

Longitude: 134° 10' to 134° 40' East

The writer visited this group of islands from 6 November to 21 November 1950.

This island group consists of the large island of Babelthuap, 153 square miles or 98,111 acres, and the smaller island Koror, 3.6 square miles or 2,316 acres, both of which are uplift islands of volcanic sedimentry or metomorphic rock. Associated with these are numerous uplifted coral patches now forming steep-sided coral islets rising to 2 and 300 feet above sea level and forming the beautiful but useless islands bordering Babelthuap and Koror and extending southward forming the islands of Auluptagal, Urukthapel, Eil Malk, and their numerous surrounding islets, having a total area of 22.3 square miles or 14,299 acres. Farther south are the low coral uplifted islands of Peleliu and Angaur of 8.1 square miles or 5,201 acres. This with a few other islands making the total of 343 individual islands in the group gives a total land area of 189.2 square miles or 120,492 acres.

Of this total area, 3,000 acres consist of mangroves, 14,299 consist of uncultivatable steep, rocky coral limestone islets, about 1,701 acres consist of airfields and auxillary installations, and 1,000 acres of phosphate mine land, giving a total of 20,000 acres of land which cannot be used for agriculture. Of the rest, less than 10,000 acres are used for village and village tree-crop cultivation, leaving 40,000 acres of grass-and-scrub-covered land, and 50,000 acres of forest, almost all of it secondary in character.

The ridge that forms the backbone of Babelthuap rises to 641 feet in elevation. It appears that, in times past, shifting cultivation has been practiced over the whole island and indeed everywhere except on the high-raised, coral-reef islets.

The group is on the edge of the typhoon belt and occasional heavy rains can be expected. In Koror in March, 1909 a rainfall of 8.45 inches in 24 hours was recorded, though the annual average is 141 inches and is well distributed.

The population was 6,731 in September, 1950, and appears to be rising rapidly. It was 6,478 in December 1949. Of this population over one-half lives on Babelthuap, 1,000 on Koror, and about 700 each on Peleliu and Angaur.

These islands during the Japanese regime exported charcoal to Japan where it is now urgently required. This export ceased, it is learned, because the office of the Supreme Allied Commander in Japan has ruled that only raw materials may be imported into Japan and that charcoal is semi-manufactured. The market to South China is closed at present owing to the political situation.

There appear to be possibilities of mineral development in Babelthuap where bauxite has been found. The inability of the natives to organize efficient mining, the refusal of the administration to permit the organization of such mining by private foreign enterprise, and the abundance of this mineral elsewhere prevent there being any possibility of development.

Water appears likely to be the urgent limiting factor in island development in spite of the heavy rainfall. The acquisition, survey, demarcation, afforestation, and protection from fire and contamination of catchment areas could be undertaken by a Department of Forestry.

Agriculture consists entirely of subsistence farming together with the growing of coconut palms for copra production. The islanders look back with affection on the Spaniards and Germans, who they say "made us plant coconuts and build sea walls and jetties." When asked if they were paid, they were astonished. "No, of course not, those things were for our good."

The Rhinoceros Beetle, a pest which first reduces the productivity of, and finally kills, coconut palms, is firmly established in these islands. Its incidence can be reduced by the introduction of a parasitic wasp, (Scolia ruficornis), but that means can never eradicate it, or reduce its numbers to insignificance as long as it is provided with perfect breeding places. These breeding places are dead coconut trees, coconut stumps, rotting logs, or stumps of other trees. Mr. Robert P. Owen, an entomologist employed by the Trust Territory administration, is working with inadequate staff in an endeavor to carry out a program of breeding-place eradication. He is unlikely to suceed until a punative law is passed making it a crime punishable by a severe fine or imprisonment for anyone to have on his land any dead coconut trees or stumps or any other dead and rotting wood. As the copra industry is of prime importance to the islands, this can not be too strongly stressed. As was pointed out earlier, the provision of sawmills and a market for timber will encourage the natives to remove and sell all usable logs and so assist in the anti-rhino-beetle campaign.

Sawmills. There are two so-called sawmills on Babelthuap, constructed of second-hand Japanese material. One, at the mouth of the Ngerbeku'u river near the village of Ngiwal, was powered by a single-cylinder diesel engine of 20-22 h.p. at 600-650 r.p.m. This mill operates only when individuals bring their logs to be cut up. There were logs present in the water, but these could not be cut as there was no market and so no money to purchase diesel oil. There is another sawmill at Arai, owned by Ngirkelau, the local Magistrate and Chief who is the uncle of Roman Tmetachl of the Native Affairs Office. This mill used a Japanese Yanmar Osaka diesel engine giving a 20 h.p. at 500 r.p.m. driving a circular saw with a 42-inch blade capable of a $16\frac{1}{2}$ inch cut. The engine would naturally not have sufficient power to cut such a large log, and the natives are unable to move such logs.

The "log pond" in the mangrove belt in front of the mill contained about 30 logs all approximately 6 feet long by 18 inches to 30 inches in circumference, or 6 inches to 10 inches in diameter. Petasch or Btaches (Calophyllum inophyllum. Lamark?) is the preferred species and is also known by its Japanese name, Tamana (Tamanu of Samoa, and Damanu of Fiji). Medu (Artocarpus communis) the Breadfruit, Kodenges (Bruguiera conjugata) a mangrove species, Ngas (Casuarina equisitifolia) the She-oak of Australia, are used. Esemolok, kuoh, las, Omai, Ugal and meei, which were not identified, also were used. Palau (Guettarda speciosa) and buit, bort, or doort, (Intsia bijuga), both hard woods, are valued, but rarely cut on a saw. This mill should be encouraged, as the operator is a man of energy and initiative.

The Japanese established at Midzuho a forest experimental plantation known to them as Ringyo. This has been completely neglected. Indeed one Palauan (Ngiriderbei) formerly employed by the Japanese on this establishment was found to be cutting down the last of the cinnamon plantation to clear the land for pineapples, which are saleable in Koror. He admitted that he had worked at making this plantation and said that he thought the trees were for scent. He was occupying the land on a permit from the administration who, for lack of any survey or inspection, did not know he was in the plantation.

There are still alive, but surrounded by coarse grass which will certainly be burnt shortly, about 5 balsa (Ochroma lagopus) trees left out of the plantation. One is growing well for the present, but the rest, from fire damage etc. are almost dead. The African Tulip Tree (Spathodea campanulata, Beauv.) is present. The teak (Tectona grandis) plantation is disappearing in a sea of grass and the trees are much branched. There are a few Kapok (Ceiba pentandra) trees all nearly dead. A few Ivory Nut Palms are growing in a swamp, but the local natives do not know what they are or what commercial value the nuts have.

The Japanese seem to have concentrated on the establishment of plantations of Btaches (Calophyllum inophyllum) from local seed, and of the large-leaved Mahogany (Swietenia macrophylla), both of which are growing well. The plantations however are in serious need of cleaning. The writer spent one day cleaning up one plantation area of about 2 acres and had other areas cleaned by the same labor gang while he visited other areas. Arrangements were made to visit the area at a later date to take precise measurements and to establish a sample plot, but owing to some errors the transport and labor did not appear.

The Mahogany trees seemed to average 50 feet in height and 34 inches in girth at 19 years of age, having been planted about 1931. The trees had been planted 3 meters x 3 meters. The Calophyllum plantation trees were 30 feet in height and 18 inches in girth. An Albizzia (?) plantation with trees 40' - 50' in height and 24 to 50 inches in girth was seen. In all the plantations here have a combined area of not over 20 acres. It would be of advantage if the Japanese forester formerly in charge, a kind man, Wagamatsu, could be employed to clear up the Forest Research area, re-establish its external boundaries, and continue experiments, training local men in plantation work.

The writer wishes to support the proposal on Palau Wildlife Reservation that the high, steep, and agriculturally valueless, coral-reef uplift islands be all declared part of a National Park System. He suggests that this can best be accomplished by declaring them to be National Controlled Forests under the scheme mentioned earlier in this report.

EXTRACTS FROM REPORT BY E. G. HOLT ON FIELD TRIP TO PALAU, 28 FEBRUARY 1950

Anguar. Tree growth is said to have been leveled during the war. At any rate there is no primary forest and the only large trees still living are a few Barringtonia, Casuarina, Eugenia, Ochrosia, etc., about the northwest corner of the island, a number of large Casuarina, some Calophyllum, Hernandia, breadfruit, etc. in the native village at the southwest end, and a few scattered, badly shot-up mangoes and an occasional large tree here and there in other parts. Practically the whole island, except the rougher parts of the northwestern quarter and the village areas, is covered with semmingly even-aged second growth dominated by Macaranga, Pinturus, and a spiny, mallow-like shrub. In better sites this second growth reaches heights of 35 to 30 feet. Over a large part of the island it cannot be older than four or five years because much of it has grown on old camp sites, and the Americans did not invade Anguar until September, 1944.

All soils are derived from coral and sea shells or from coral limestone. There is no volcanic material evident anywhere near the surface of the island. Neither was any laterization observed.

Koror and Babelthuap. Except for a narrow, precipitous, and extremely rough ridge of coral limestone along the eastern margin of Koror and the opposing shore of Babelthuap, both islands are of volcanic materials. The soils are red, leached, and highly laterized. Evidences of soil erosion are frequent and extensive. Both islands were once subjected to much more intensive human use than at present. Now extensive areas of formerly cultivated land lie idle and are grown up to coarse grasses and brush.

The Japanese forest-experiment station on Babelthuap should be rehabilitated at least to the extent of cleaning up the plantings that still exist.

These include American mahogany, teak, and balsa that should be utilized as sources of seed with which to extend the plantings of those valuable species. As the production of fine timbers is the safest and best long-range development that can be undertaken in these tropical islands, it is recommended that seed from the above-mentioned trees, as well as from the small grove of excellent mahogany trees on Koror, be systematically gathered, and that the plantations started by the Japanese be continued and expanded annually to the extent of the resources available.

PALAU WILDLIFE RESERVATION

In the following memorandum dated 4 April 1950 and addressed to the High Commissioner of the Trust Territory of the Pacific Islands, the Civil Administrator of the Palau District approved the Interim Regulation to establish the Palau Wildlife Reservation:

"In furtherance of the recommendation made by the Staff Conservationist, the proposal to set aside the Urukthapel and Eil Malk island complexes as a wildlife sanctuary and forest preserve was presented to the Palau Council at its regular metting on 27 March 1950. After free and thorough discussion the proposal was approved by the council.

"The proposed reservation is favored by the Civil Administrator for the following reasons:

a. It will insure the continued existence of animals and plants found nowhere in the world outside of the Palau Islands.

b. It will serve as a reservoir of animals and plants valuable to the Palau people, from which adjoining areas may be continually replenished.

c. The area involved is completely uninhabited and is wholly unfit for agricultural use except for small spots (totaling 30.46 acres), behind the few beaches, that are now leased under revocable use certificates to allow utilization of the coconuts growing there.

d. The area is physiographically and scenically unique and it is conceivable that at some future time would attract a lucrative tourist trade to the Palaus.

"In order to expedite the establishment of the reservation, a draft interim regulation, embodying the provisions believed by this office to be desirable, is enclosed for the High Commissioner's consideration.

"For marking the area, pursuant to the provisions of Sec. 8 of this regulation, it is estimated that an allotment of $500.00 will be needed."

INTERIM REGULATION

Establishment of the Palau Wildlife Reservation

To the people of the Trust Territory of the Pacific Islands:

Sec. 1. This regulation is issued in accordance with the expressed policy of the Trusteeship Agreement and is designed to conserve the natural resources of the Trust Territory for the long-term benefit of all the people, to preserve from extinction the native plant and animal life, and to protect from spoilation one of the unique scenic areas of the world.

Sec. 2. There are many kinds of animals and plants native to the Palaus which occur nowhere else in the world, and which therefore are in danger of serious reduction in numbers or actual extinction as the human population increases, that make their homes on the wooded limestone islands.

Sec. 3. These limestone islands of the Palau Group, hereinafter specified, are considered unsuited for agricultural use, but are so situated as to meet the conditions specially required for the purposes of a wildlife sanctuary and forest preserve that would provide the needed protection for these peculiar plants and animals.

Sec. 4. For the reasons above stated, the Area described below is hereby designated as the "Palau Wildlife Reservation" and is hereby set aside as a wildlife sanctuary and forest preserve.

Sec. 5. The Palau Wildlife Reservation shall consist of the Island of Urukthapel and its satellite islets; the Island of Eil Malk, otherwise known as Mecherar or Meherehar, and its satellite islets; and the surrounding waters, reefs, and shoals bounded as follows:

On the northeast by Malakal Harbor and Malakal Passage;

On the southeast by the outer reefs;

On the southwest by the southwesterly shore of Oiron Island, the islet northeast of Abappaomogan Island, and by Schonian Harbor and Denges Passage;

On the northwest by the northwesterly shore of Orion Island and by Toi Klemadaol, otherwise known as Kuramadarou Passage, and the approaches thereto.

Sec. 6. All setting of fires, cutting of timber or fuel wood, destroying or removing the plant growth, tilling the soil, shooting, hunting, snaring, trapping, or otherwise taking or molesting any type of animal life, its eggs or young, including the eggs of the incubator bird, within the limits of the Palau Wildlife Reservation is prohibited, except that:

a. Boating and fishing are permitted in those waters not landlocked.

b. Camping is permitted on the beaches.

c. The building of camp fires is permitted on the beaches, provided such fires are limited to the needs of cooking and are promptly extinguished when they have served that purpose. Full penalties will be incurred by anyone permitting a fire to damage the vegetation of the area.

d. The use of driftwood or other dead material on the beaches is permitted for building camp fires on the beaches.

e. Scientific specimens may be taken in accordance with permits issued as provided in Section 7.

f. Coconuts may be harvested from existing trees under permits issued as provided in Section 8.

Sec. 7. The High Commissioner may, in his discretion, issue permits to properly accredited persons to conduct natural history research within the reservation and to take such specimens as may be reasonably needed in such research. Such permits may by their terms limit both the kinds and numbers of specimens that may be taken.

Sec. 8. The Civil Administrator, Palau District, shall cancel after reasonable notice to the holders thereof all outstanding revocable certificates

assigning temporary use of lands situated within the area hereby set aside as a wildlife sanctuary and forest preserve, but may, in his discretion, issue revocable permits to the holders of such certificates, provided that the permittees do not plant additional coconut trees or other crops or otherwise disturb the area.

(The reason for the foregoing is that the revocable certificates now outstanding are so broad in their terms that the assignees may do general farming, construct buildings, and otherwise defeat the purposes of the proposed reservation.)

Sec. 9. The Civil Administrator, Palau District, shall cause to be erected and maintained at conspicuous points along the outer shores of the outer islands within the reservation, conspicuous signs in both English and Palauan warning all persons approaching the area of its purposes and of the acts which are prohibited therein, and notifying them that violators are subject to criminal prosecution.

Sec. 10. Any person violating this regulation shall, upon conviction thereof, be imprisoned for a period not exceeding six (6) months or fined not more than one hundred dollars ($100), or both.

TRUK ISLAND GROUP

Latitude: 7° 20' North

Longitude: 151° 30' East

The writer visited this group of islands between December 28, 1950 and January 4, 1951.

This island group has a total area of 38.56 square miles or 24,678 acres. Of this area about 678 acres are mangrove, 300 are airfields and administration buildings, 3,700 are permanent village cultivation areas, and 20,000 consist of scrub and grassland.

The islands are mountainous, rising to 1,234 feet in elevation with steep slopes.

Rainfall averages 127 inches, being heavier in the summer months of April to September. The island is in the typhoon belt, though very destructive storms are rare.

The population is 9,974 for the Truk Group proper, and appears to be rising slowly.

Minerals. As far as is known, Truk has no mineral deposits.

Water Supply. There appears to be no present shortage of water on the island, but the acquisition, survey, demarcation, afforestation, and protection of water-catchment areas cannot be postponed much longer with safety.

Agriculture. There appears to be a certain indecision in the minds of the administration as to the position of the Agricultural Officer, who is in certain aspects regarded as Director of Agriculture, Trust Territory; and in others is regarded as the Agricultural Officer, Truk, or even of Moen only. In any case he has inadequate staff, no experimental farm, and no overall control over agriculture or agricultural expenditure.

Sawmills. There is a resaw unit operated, apparently quite well, by

Trukese at the administration headquarters. It is naturally not operated on an economic basis, the number of laborers present being excessive, and the cost of amortization of equipment, the cost of electricity, etc. being ignored. This mill resaws lumber left over from the war.

Another sawmill of larger capacity, run by a Caterpillar diesel engine, and situated on the coast is abandoned, some saws having rusted in their original boxes. The mill could work if there was anyone who wanted to work it.

PONAPE GROUP

Latitude: 7° North

Longitude: 158° 20' East

This group of islands was visited between 6 December and 28 December 1950.

The area of this group is 129 square miles, or 82,560 acres. Of this approximately 7,560 acres consist of mangrove forest; 5,000 acres consist of village cultivation; 5,000 consist of coconut plantations; 1,000 consists of airfields, etc., 35,000 acres consists of secondary scrub; 25,000 acres consists of poor high forest of secondary-type species, mainly over 1,000 feet elevation; 4,000 consists of abandoned land now covered with grass and reeds.

The rainfall averages 185.5 inches falling on 309 days of the year, with but slight difference from month to month.

Ponape has a population of 6,260, and appears to be rising.

Minerals. Bauxite has previously been reported in the island, but has not been worked. The writer has submitted a report on an ore which may be auriferous. It appears, however, that minerals can do but little to assist the island economy.

Water Supply. This island is apparently in an enviable position in regard to water supply. It could moreover be made largely independent of imported fuel if the hydro-electric works commenced by the Japanese were rehabilitated and other hydro-electric works built. The main hydro-electric works, in operation in 1947, have been replaced by standard diesel generator units dependent on imported fuel.

Agriculture. The Agricultural Experiment Station shows evidence of what could be done with the sunshine, heat, adequate rainfall, and intrinsically fertile soil of this island, but it lacks sufficient staff.

The Agricultural Officer was specifically forbidden to grow vegetables or produce farm products to supply the Naval personnel on the base. Had this market not been denied him, and had the Station been run on semi-commercial lines, the import of expensive frozen foods for the ships' stores could have been largely eliminated, the Station could have been expanded at no cost to the U. S. taxpayer, and the island rendered less dependent on imports in the event of a war. It is clear that this order to concentrate all work on production for native use was given with the best intentions, but it failed to consider the needs of a cash market, and the vitalizing effect of an actively producing enterprise.

It is strongly recommended that the present policy be reversed and that both here, and at each Administrative headquarters, there be set up Agricultural and Dairy Stations to supply the needs of the local staff and imported farm products. At the same time, these stations should include on their staff at least one Forest Guard who will raise seedlings of trees suitable for local planting. This matter is discussed more fully earlier in this report.

Coconut Plantation of Metalanim. This coconut plantation, managed by Mr. Manual Sproat, was the most encouraging aspect of the whole primary production field in the Trust Territory. The provision of a small sawmill at this estate would be of advantage. It is urged that the whole administration of this estate be put under the control of the Director of Agriculture. Already detailed financial control of native salaries by accountants, distant from the scene of operations, has caused dislocation of the efforts to rehabilitate this estate.

Mangrove Forests. This island group is particularly well furnished with mangrove forests, potentially of great economic value as a source of firewood, charcoal and some lumber.

The most numerous species is Rhizophora mucronata, Linn., known as Ohobaherugi (Japanese), Aaku (Ponapean). This pioneer species in open situations on the coast where the water is almost pure sea water, grows to a height of some 30 feet with numerous stilt roots and aerial roots from the branches, and semi-horizontal stem. In more sheltered sites in brackish water the tree grows to 60 feet and has an erect habit with few aerial roots.

Brugumera gymnorrhiza, Lam., is the next most numerous species. It is known as Wohirugi (Japanese) and Shuumu (Ponapean). It makes excellent poles and posts.

Carapa obovata, Bl., (or Xylocarpus granatus, Koen) the Cannon-ball tree, or Puzzle-nut tree is common. This species yields a strong hard wood especially valued for boat knees.

The most striking feature of the mangroves here and at Truk is the presence of large numbers of a large tree yielding fine lumber, Sonneratia acida, Benth. This is known as Gamapusiki (Japanese), and Koto, (Ponapean).

Lumnitzera coccinea, W. et A., with its small bright scarlet flowers is found in dry areas. It is called Akabanaherugemodosa in Japanese, and Uengaru in Ponapean.

Heritiera littorales, Dryand is found and known as Sakesisnasukaugi.

It is advised that these mangrove forests be surveyed and brought under systematic management as soon as possible, both to supply local needs and to demonstrate, in areas seen daily by the natives, what scientifically managed tree culture really is and what it can do.

An attempt has been made to introduce some measure of control over mangrove cutting. While the writer appreciates the desire for action on the part

of the officer issuing the order, he feels that it is a control for control's sake. It accomplishes nothing. Not a single extra tree will grow because of this order. It is this kind of order that makes the natives dissatisfied with our bureaucracy. Until a proper scientific working plan is prepared for the mangroves, no useful controls are possible. For this reason this report does not advise any laws or regulations until there is adequate forestry staff and a simple, yet scientifically correct, plan for the management of a forest area.

Sawmills. There is a sawmill in the town. It is the perfect example of what happens when such enterprises are handled by non-technical men who mean well. The mill is powered by a diesel engine and has one break-down saw, inserted tooth, taking half an inch of saw kerf per cwt. It has no other saws. It has been handed over to the control of a native who knows how to run it, but has no idea of the necessity of an assured log supply, an assured market, seasoning facilities, and the thousand and one sides of sawmill management. As run, it is not an economic proposition. There is a sawmill on the other side of the island powered by a gasoline engine. It is idle, as gasoline is hard to get. It is simpler and cheaper to import lumber than to import gasoline to cut lumber from poor logs on an inefficient mill. There is available on the site a fast stream which could turn a water-wheel. Unfortunately this old-fashioned source of power is not considered.

The most successful "commercial" mill is run by an American, Mr. Kennedy, on behalf of a high-ranking chief, Mr. Oliver Nampei, who owns some islands and between 3,000 and 4,000 acres of land in Ponape. The mill is powered by a Japanese semi-diesel engine of about 40 h.p. driving a break-down bench, and two other smaller saws. Lumber is cut up either at a fixed price or on the basis that the mill takes half the output of the logs as its share. The prices are, by local standards, reasonable. Pieces 1/4" x 1" are charged 2 cents per

foot run. This works out at 96 cents per board foot, or $960 per 1,000 board feet for cutting. Pieces 6" x 6" are charged 19 cents per foot run or 6.33 cents per board foot, or $63.00 per 1,000 board feet for cutting.

It is recommended that Mr. Nampei and Mr. Kennedy be offered the chance to purchase, on the installment plan, a modern American sawmill using waste wood for fuel.

The most striking characteristic of the island, when seen from the air and sea, is the large area of hill land covered with dense forest growth. This at first glance appears to show that the island could support a lumber industry. Unfortunately, even if the other requisites of a lumber industry had been present, the island could not have supported such an industry. The forest is very poor, consisting largely of Campnospermum sp. known locally as Tong, and of Eliocarpus sp., known as Sethack. Calophyllum inophyllum, known as e-sow, appears only in coastal areas, and is apparently an introduction of prehistoric times. The nutmeg Myristica sp., known as karara is present but rare, but the secondary scrub which covers large areas is the omnipresent Hibicus tilliaceus, known as kalau.

An experimental Japanese plantation area in the interior of the island was visited. There an abandoned Balsa (Ochroma lagopus, Swartz) plantation was visited. This is now overgrown with grass 5 feet in height.

EXTRACTS FROM REPORT BY E. G. HOLT ON FIELD

TRIP TO PONAPE, 8 AUGUST 1949

Plants to be considered (for experimentation and development by the Ponape Agricultural Station) fall naturally into four groups: (1) those of primary importance as subsistence crops; (2) dietary supplements; (3) commercial crops; and (4) timber trees. Because any given species may fall into more than one category, the suggestions that follow are listed alphabetically under the kind of plant concerned except that timber species are discussed under the section on Forestry. The list might be considerably extended, but is purposely restricted to essentials, plus a few species believed worthy of special consideration.

Avocados: As one of the most nutritious of fruits and one that is universally relished in other tropical parts of the world, the avocado might well find wider acceptance among the natives of Micronesia. It is also a fruit that stands shipment fairly well, so it might become a source of income in certain islands. It is suggested for the attention of the agricultural station.

Bananas: Bananas are grown throughout all of the islands so far visited and do well vegetatively, but the fruit, while often of very fine flavor, is insignificant. Stems seldom bare more than a half dozen hands, where a plant of equal vigor in Central America would produce a dozen or more. It is suggested that plantains and abaca be included with the other bananas....

Breadfruit: On many islands breadfruit is the most important single subsistence plant. However, its fruiting season is reported to be short, so any extension of the season would be of great value to the people....

Cacao: One of the great needs of the Territory is an agricultural crops of sufficiently high value to overcome the handicap of limited transportation

facilities and high freight rates. Cacao offers considerable promise as such a crop. Not only is there no immediate prospect of diminishing demand for cacao, but the world situation would indicate no possibility of overproduction within the foreseeable future. Moreover, the natives might well learn to like chocolate and make their own with mortar and pestle, as is the practice in remote parts of Brazil. Another advantage is that it is a soil-conserving tree crop. A number of trees are already well established and in bearing on the agricultural station.

Citrus Fruits: There seems to be no good reason why the Guamanian (and possibly the Japanese) market would not support a small citrus industry in some of the islands. Oranges and some good limes have been observed already established in places, and grapefruit might be introduced.

Coconuts: The reason for the inclusion of this species is that, notwithstanding the fact that the coconut has served the Micronesians for centuries as food, drink, and building material, it is still possible to improve quality and yields.

Mangoes: This fruit is widely distributed through the islands, but is understood to be of inferior quality.

Papayas: The current effort to start a modest papaya industry in Truk makes it almost imperative tnat the participants be provided with better varieties of papaya than those now available to them.

Forestry: Botanist Sidney F. Glassman and entomologist Robert P. Owen, who made an expedition into the mountains of Ponape recently, report a considerable number of good timber trees at the higher elevations. However it is evident that these trees are inaccessible to the natives. With the exception of a few sticks of breadfruit, not one log being brought into the sawmill operated at Colonia by the Civil Administration could by any stretch of the

imagination be considered of merchantable quality. Most of them came from the fringing mangrove swamps and all were short, gnarled, and crooked. Plainly, therefore, there is need of a forestry program on Ponape. This of course is necessarily a long-term program, but by the same token its initiation should not be too long delayed.

The objective should be to establish useful trees in easily accessible places on land not immediately needed for agricultural purposes. Species for planting should include American mahogany, Philippine mahogany, Spanish cedar, and teak. As good, straight poles are always needed for masts, consideration should be given to Araucaria Bernieri from New Caledonia. Seeds could easily be obtained from the Institut Francais d'Oceanie at Noumea. Both American mahogany and teak are already growing well on the agricultural station and should supply enough seed for initial direct seeding and propagation trials while other sources are being sought.

Because of the high cost of nursery operation and the likelihood that the natives would not be willing to expend the labor for transplanting even if given the nursery stock, trials of direct seeding of the species mentioned should be made before any large-scale operations are undertaken. Such trials should be made with and without site preparation.

facilities and high freight rates. Cacao offers considerable promise as such a crop. Not only is there no immediate prospect of diminishing demand for cacao, but the world situation would indicate no possibility of overproduction within the foreseeable future. Moreover, the natives might well learn to like chocolate and make their own with mortar and pestle, as is the practice in remote parts of Brazil. Another advantage is that it is a soil-conserving tree crop. A number of trees are already well established and in bearing on the agricultural station.

Citrus Fruits: There seems to be no good reason why the Guamanian (and possibly the Japanese) market would not support a small citrus industry in some of the islands. Oranges and some good limes have been observed already established in places, and grapefruit might be introduced.

Coconuts: The reason for the inclusion of this species is that, notwithstanding the fact that the coconut has served the Micronesians for centuries as food, drink, and building material, it is still possible to improve quality and yields.

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CONTROL OF MANGROVE

The following order was issued as Ponape District Order No. 3 - 50 on the control of mangrove:

TO THE PEOPLE OF THE PONAPE DISTRICT:

The following is declared to be the law in the Ponape District effective 15 August 1950.

Section 1. Title to mangrove forests in public domain; supervision and control. All the right, title and interest in the mangrove forests in the Ponape District now in the public domain; all mangrove is in the public domain except (possibly) for some owned by Nampey in Kiti District, are and shall remain in the Government of the Trust Territory of the Pacific Islands. The immediate supervision and control of the mangrove forests is the responsibility of the Civil Administrator, and will be exercised in accordance with the provisions of this order.

Section 2. Grant of use rights to municipalities; permits to cut mangrove for private use. The Civil Administrator may from time to time designate certain mangrove areas as municipal areas. All public mangrove forests are municipal areas at present. Provision is made for establishing rotation of use, and grant to a municipality the right to cut, remove, or use the mangrove from these areas for municipal or private purposes. The Magistrate or Treasurer of a municipality which has been granted such a right may issue permits to permanent residents of the Ponape District to cut, remove, or use the mangrove for private purposes, but not for commercial purposes. Such permits will be granted without charge except that a charge of not more than one dollar per tree may be made for cutting trees having a diameter of more than 12 inches. The money so received will be paid into the Treasury of the municipality by which the permit is issued.

Section 3. Permits to cut mangrove for commercial use. The Civil Administrator or his properly authorized agent may, from time to time, issue permits to permanent residents of the Ponape District to cut, remove, sell and use mangrove from any area for commercial purposes. Such permits will set forth the size, type and quantity of mangrove to be cut, the purposes for which the wood may be removed, and the compensation which shall be paid for the mangrove removed. Charges for commercial use are at present the same as for private use. One half of the compensation shall be paid to the municipality in which the mangrove forest is located and one half shall be paid into the Treasury of the Trust Territory. Charges made for permits and fees collected as compensation for the removal of the mangrove shall be uniform throughout the Ponape District, and shall be subject to change from time to time at the discretion of the Civil Administrator. Permits shall be for a definite period not to exceed one year. Permits are not transferrable.

Section 4. Revocation of permits. Permits may be revoked by the Civil Administrator as follows:

a. Immediately on finding that the permit holder is engaged in an illegal business or is conducting operation in violation of any law or regulation of the Trust Territory, or in violation of any provisions of the permit.

b. On ten days notice on finding by the Civil Administrator that continuation of the operation will be contrary to the public interest. The notice of termination shall include a full statement of the reasons why the continuation is contrary to the public interest, and, where the revocation is being ordered because of the methods of operation employed, the permit holder shall be given reasonable notice and opportunity to correct the objectionable conditions before the notice of revocation shall be issued.

The permit holder shall have the right to appeal the revocation to the District Court or, if the District Court is not available within a reasonable time, to the Justice Court, which court may, after hearing, confirm the revocation, revoke the revocation, or modify the revocation. The court may syspend the revocation pending the hearing of the case.

Section 5. Reports. The permit holder shall make reports in such form and at such times as may be required by the laws or regulations of the Trust territory or the provisions of the permit. The Civil Administrator may, by regulation properly issued and promulgated, require reports from permit holders when such requirements do not duplicate or conflict with other laws or regulations of the Trust Territory.

Section 6. Acts prohibited; penalties. It shall be unlawful:

a. To remove mangrove from any area without a proper valid permit.

b. To use mangrove cut and removed under a permit for purposes other than those set forth in the permit.

c. For any magistrate or treasurer to arbitrarily refuse to grant a permit to cut mangrove from a municipal area for private use.

d. To wilfully damage, burn, or otherwise injure or destroy any mangrove forests.

e. To fail to make reports required under the provisions of this order or by the laws or regulation of the Trust Territory.

Any person who violates any provisions of this order shall be guilty of a misdemeanor and upon conviction thereof shall be sentenced to pay a fine of not more than one thousand dollars ($1,000.00) or to be imprisoned for a period of not more than one year, or both.

The permit holder shall have the right to appeal the revocation to the District Court or, if the District Court is not available within a reasonable time, to the Trust Court, which court may, after hearing, confirm the revocation, revoke the revocation, or modify the revocation. The court may expand the revocation during the hearing of the case.

Section 5. Reports. The permit holder shall make reports in such form and at such times as may be required by the laws or regulations of the Trust Territory or the regulations of the Council. The Civil Administrator may, by regulation properly issued and promulgated, require reports from permit holders when such requirements do not duplicate or conflict with other laws or regulations of the Trust Territory.

Section 6. Acts prohibited, penalties. It shall be unlawful:

a. To remove manganese from any area without a proper valid permit.

b. To use manganese sand and removed water a permit for purposes other than those set forth in the permit.

c. For any corporation or transferee to arbitrarily refuse to grant a permit to mine manganese from a municipal area for private use.

d. To willfully damage, harm, or otherwise injure or destroy any manganese formula.

e. To fail to make reports required under the provisions of this order or by the laws or regulation of the Trust Territory.

Any person who violates any provisions of this order shall be guilty of a misdemeanor and upon conviction thereof shall be sentenced to pay a fine of not more than one thousand dollars ($1,000.00) or to be imprisoned for a period of not more than one year, or both.

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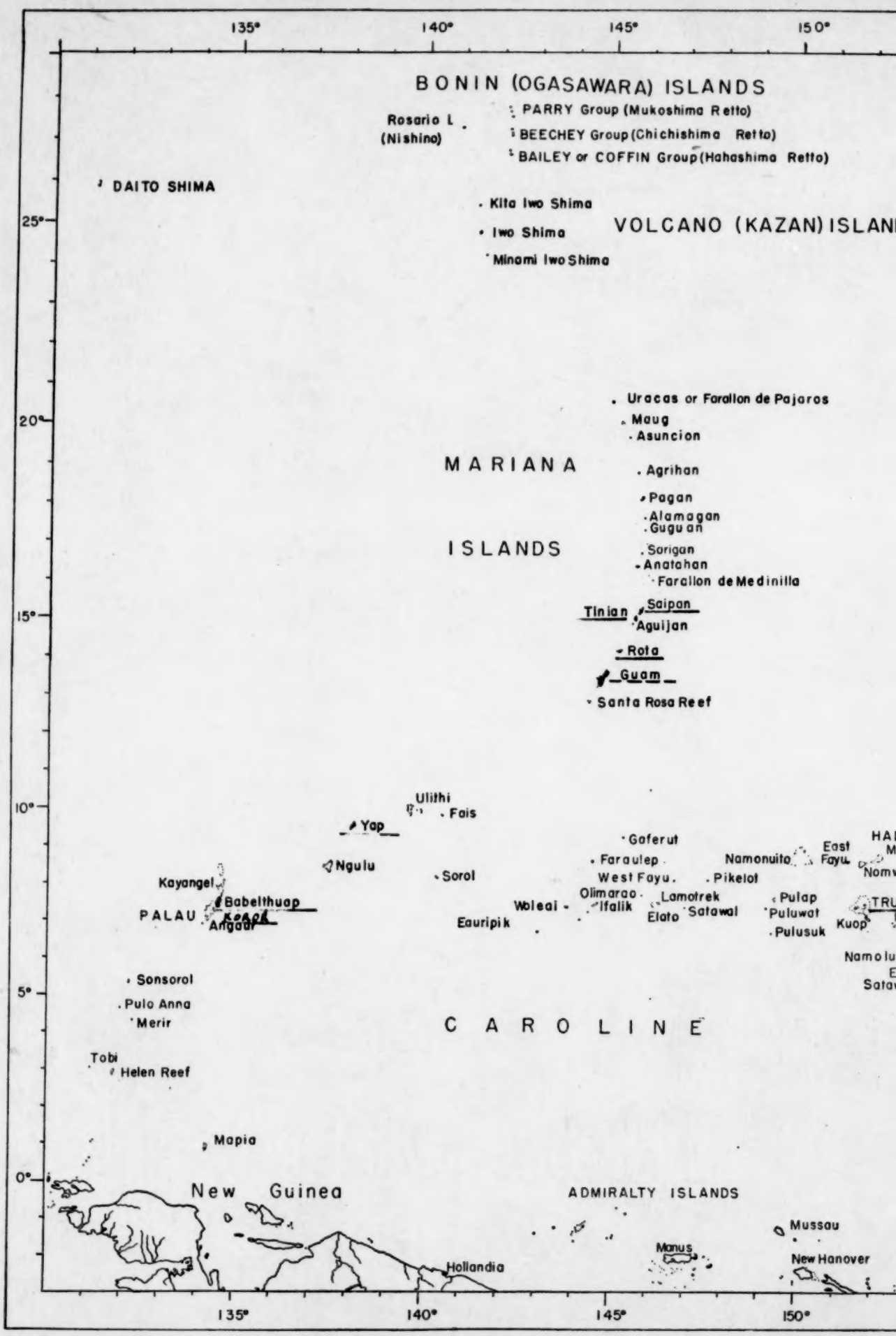
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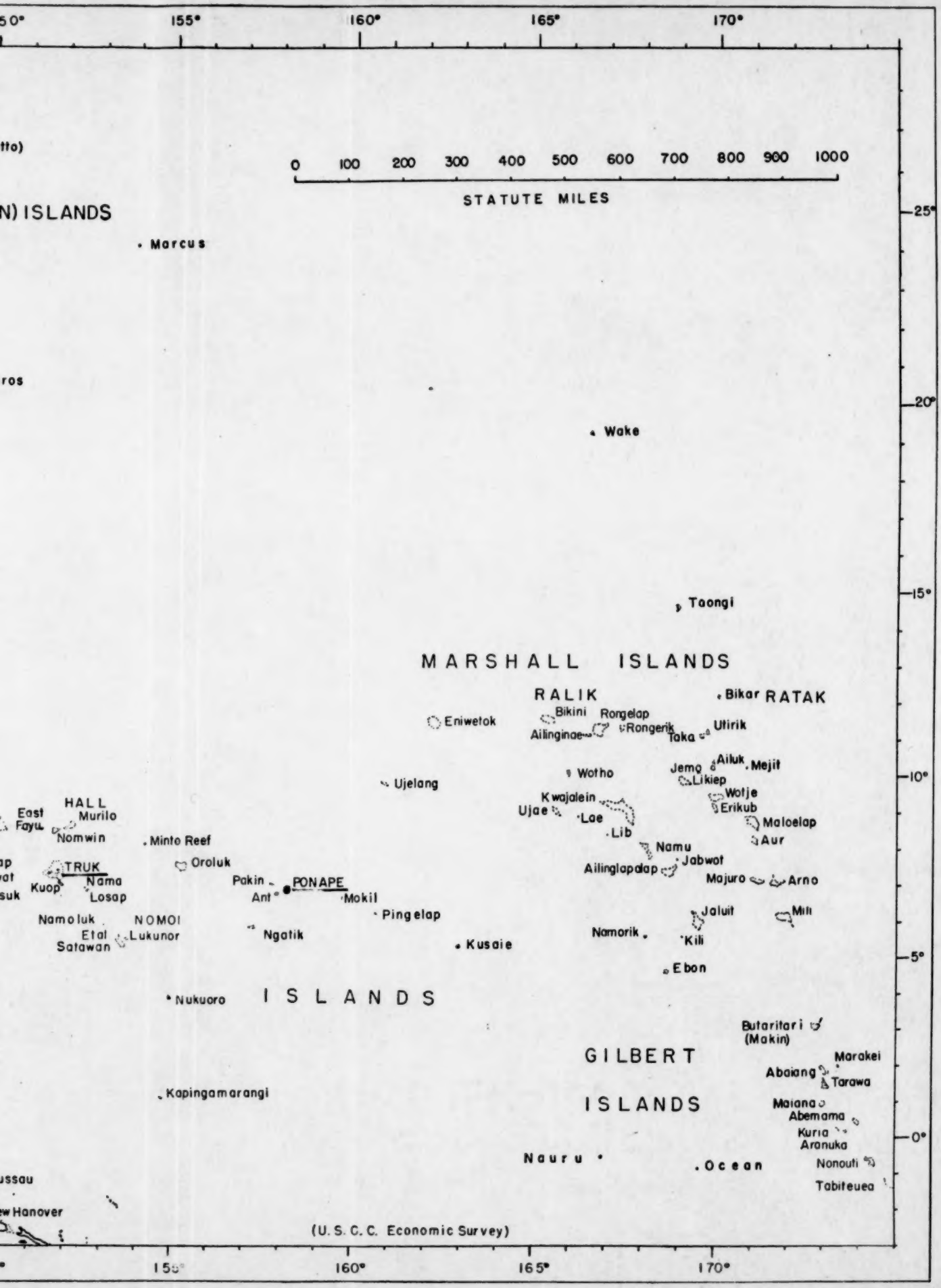
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